AVIATION WEEK

A McGRAW-HILL PUBLICATION

JAN. 26, 1948

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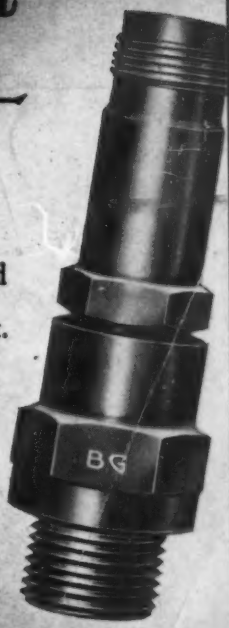

Left to Right: George W. Truman, Clifford V. Evans, Jr.

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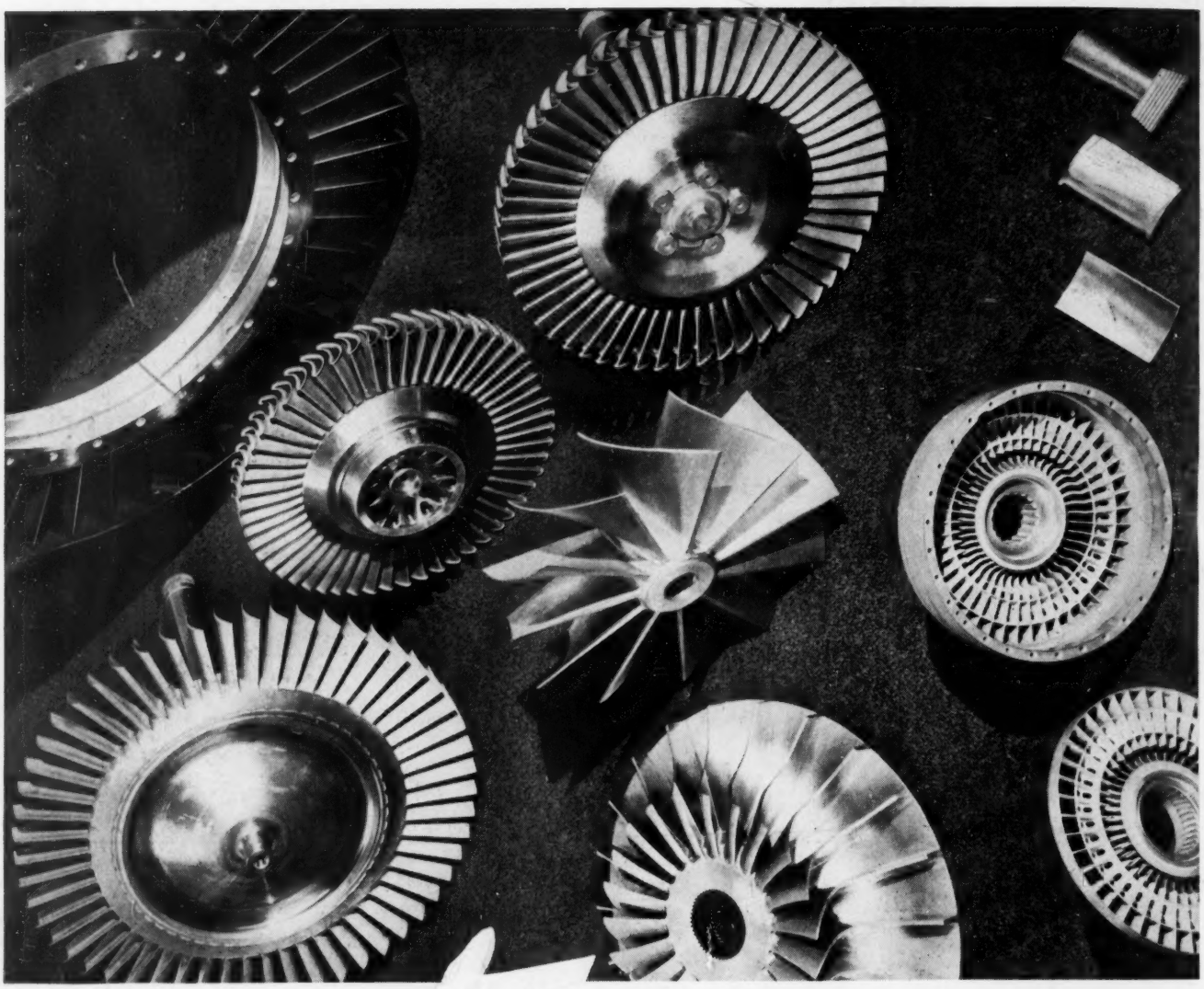

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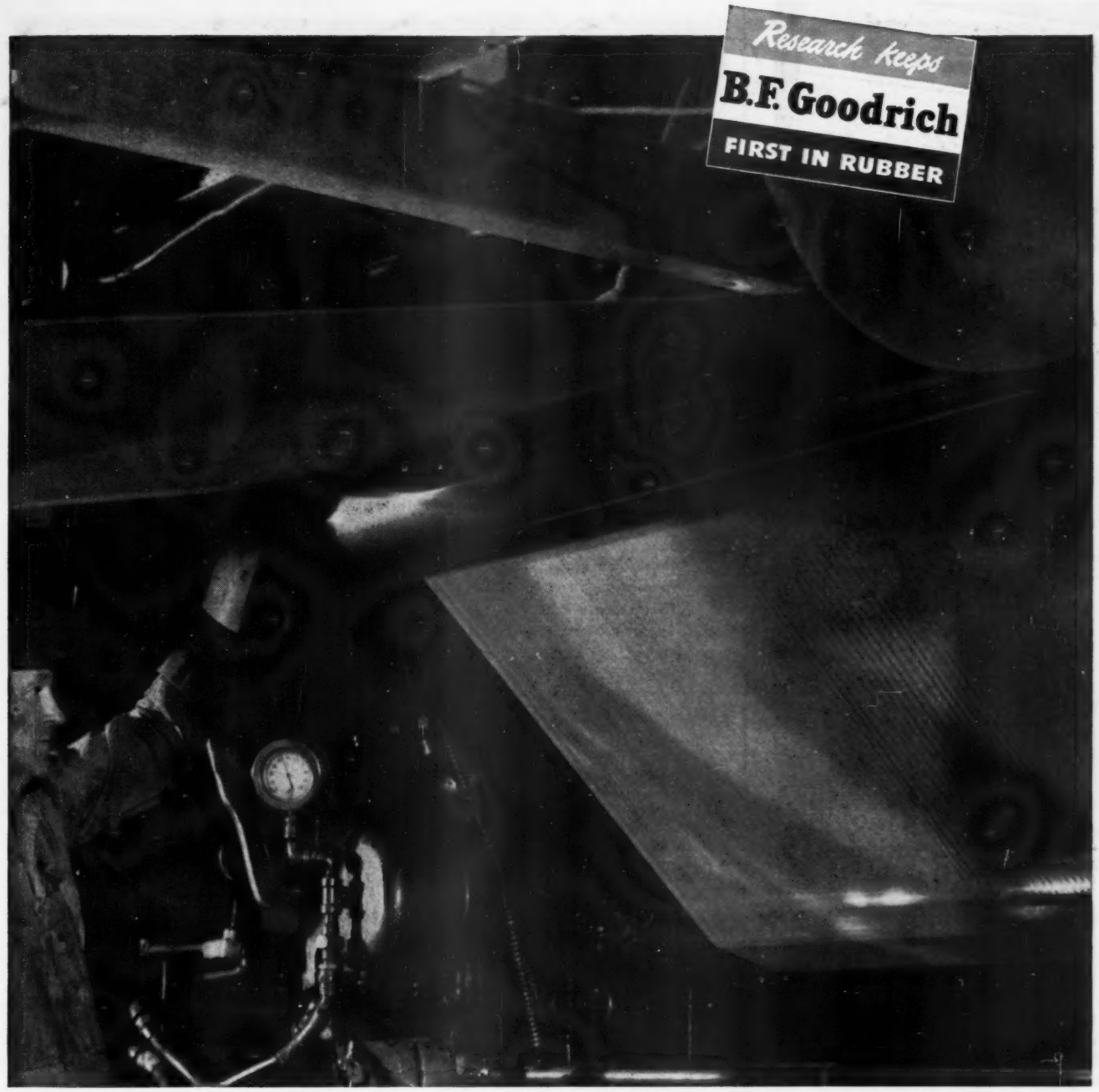

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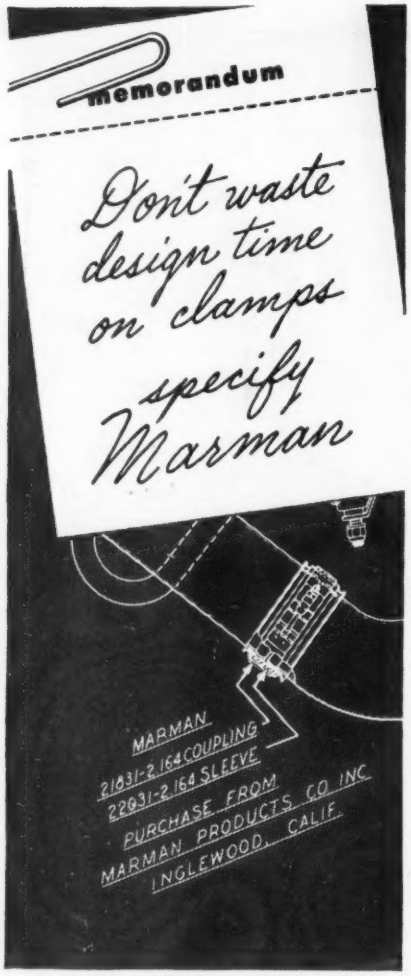

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AVIATION WEEK

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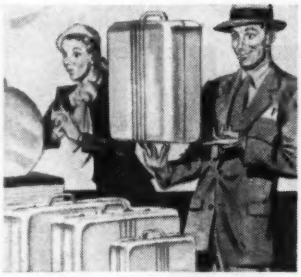

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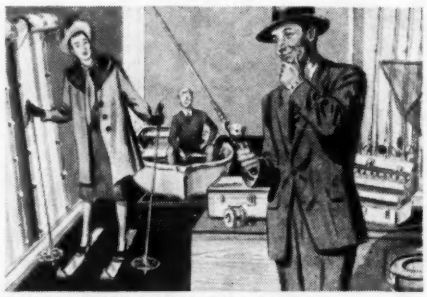

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THE AVIATION WEEK

NEW BOOK—Events in Washington have followed in such rapid succession as to make it apparent that governmental relations with aviation are not just turning a new page; they are likely to constitute a new book.

First was the Landis dismissal, then the Air Policy Commission report. Last week came the submission of resignations by CAB member Harllee Branch and CAA Administrator T. P. Wright. The Air Policy Commission's proposals for a revamping of the governmental aviation establishment as yet are merely that, with no indication of immediate steps to implement them.

But the CAB membership changes are already a tangible factor and so, too, is the resignation of Wright. Although Wright's plea to quit was not immediately accepted by the President, few believe he could be persuaded to remain at his post for long.

Even the two things taken together—the CAB vacancies and Wright's imminent departure—could mean a sharp change in the direction of policies and procedures. Acceptance by the President of the Policy Commission's recommendation for a Department of Civil Aviation would make such a change in direction almost certain.

MARKING TIME—Meanwhile, action taken now on policy matters up before CAB and CAA will seem a little hollow. With Clarence Young's place on the Board still unfilled, CAB is a three-man body. Even with five men, CAB fell behind in its work. There is no reason for observers to believe that the present three members can move faster than the full Board was able to do.

There also could be an understandable reluctance on the part of Ryan, Lee and Branch to attempt to sweep away before the advent of the three new members the knottiest problems that so long have been before the Board.

After the President succeeds in filling the spots of Young, Landis and Branch, the Board perhaps would have a new voting majority.

The situation on the CAA side is somewhat similar. Wright, while acknowledged as a sound and progressive thinker, has not been able to keep tabs on the whole sprawling CAA organization. While he "streamlined" it, it still covers such a wide field that major policy decisions sometimes must be made on lower levels by men who have not always been aware of, or sympathetic to the Administrator's thinking. Many of these men cued from Charles I. Stanton, deputy administrator, who also now has bowed out of CAA, at least temporarily.

Result is an area for change in CAA policy and administration as wide as that on CAB.

TALLY SHEET—A quick glance at only a few of the pending matters in CAB and CAA indicates the effect on practically all phases of the industry of any broad changes of view that might occur within either agency.

Both economic and safety matters of vital concern to air transport were before CAB when its membership began disintegrating. The jockeying for position and power between the scheduled, certificated lines and the non-certificated operators has by no means reached the final round.

Either an off-shoot or an integral part of this (depending on viewpoint) is the cargo situation.

The Board was still involved in a mental wrestling with the safety recommendations of the special Presidential inquiry when Landis, chairman of the safety group and most interested in pushing its proposals, was passed over.

This leaves the remaining three to grapple with such explosive issues as temperature accountability, fire prevention and minimum runway lengths.

Just when the Board probably thought it had disposed of the surface carrier matter largely by ignoring it, it was thrown back by the Air Policy Commission.

CAA'S PROBLEMS—CAB shares with CAA another walloping headache that affects manufacturers as well as air carriers. This is the continued tinkering with Part 04 of the Civil Air Regulations which establishes airworthiness standards for transport planes.

No one seems happy about Part 04b, the supposedly effective version. Much of 04b represents CAA thinking, so top-level changes in that agency might hurry a re-draft.

CAA has its exclusive problems: navigation and landing aids, the lagging airport program with its regulations that have been written twice, amended and are now being amended again; lightplane airworthiness regulations; safety inspection; and enforcement of private flying regulations.

Despite recurrent criticism, generally by indirection, of Wright's administration, changes for the better that have been made in CAA have come about through his actions. But his successor will still find a basket-full of worries.

OVERHAULING POSSIBLE—There is to be reckoned with the possibility of a thorough-going overhauling along the lines suggested by the Air Policy Commission.

Wright perhaps could be persuaded to stay on a few months longer while plans were jelling. CAB could be left to struggle along as a three-man Board while legislation was prepared to create the Civil Aviation Department.

There are no odds yet on whether the President will move fast on the Policy Commission's recommendation or, if he does, what the congressional reception is likely to be. If it looked like a controversial issue, likely to demand extended consideration and debate, chances of passage would be slim. Congressmen want to go home and start politicking early this year.

All the outstanding advantages of VHF communication and navigation are combined in two new Systems designed and manufactured by Aircraft Radio Corporation.

THE TYPE 15A VHF OMNI-DIRECTIONAL RANGE RECEIVING SYSTEM provides an unlimited number of courses from the new VHF Omni-Directional Ranges, as well as operation on VHF Runway Localizers and Visual-Aural Airways Ranges. Simultaneous voice feature is included on these ranges. The *tunable* A.R.C. Receiver makes it possible to receive VHF communications on *any* frequency selected while in flight – no need for several receivers to cover the entire VHF band.

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The dependability and performance of these VHF communication and navigation systems spells increased safety in flight, more efficient aircraft operation. Specify A.R.C. for your next installation.

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DEPENDABLE ELECTRONIC EQUIPMENT SINCE 1928
Boonton, N. J.

NEWS DIGEST

DOMESTIC

Month-long negotiations between TWA and the Airline Navigators Association broke down last week and union spokesmen said a strike of navigators on international flights was "probable."

Air Force has consolidated Air Proving Ground Command with the Air Materiel Command in the interests of economy. Formerly an independent command, APGC tests the tactical proficiency of new aircraft and weapons. Renamed the Air Materiel Proving Ground, the facilities at Elgin Air Force Base, Fla., will continue to handle its present function.

An overseas air parcel post service is now being organized under the direction of Postmaster General Jess M. Donaldson. The service will begin as soon as international agreements necessary for the service are ratified.

FINANCIAL

Beech Aircraft Corp. reports net income after taxes of $319,858, equivalent to 80 cents a share on 400,000 shares outstanding for the quarter ending Dec. 31. This compares with a loss of $116,851 for the same period last year.

Airline insurance companies estimate a gross loss of $5-9,000,000 for 1947 through heavy payments for aircraft accidents. Crashes cost the companies more than $4,600,000, flight losses in which no lives were lost another $5,000,000 and legal liability payments for passenger fatalities cost more than $5,000,000.

DeHavilland Aircraft of Canada, Ltd., reports net loss of $616,104 in Canadian currency for the year ended Sept. 30 compared with a net income of $143,347 for the previous fiscal year.

FOREIGN

BOAC has announced plans to move its Constellation maintenance base from Dorval Airport, Montreal, to Filton Aerodrome, Bristol, England. The action is being taken largely to save dollar expenditures.

United Kingdom and the Philippine Republic have concluded a civil aviation agreement in Manila. The pact covers services from the Philippines to England and Australia and from Manila to Hong Kong.

Palestine government has given official approval for establishment of an Arab and a Jewish airline. The Arab carrier, Eastern Airways, Ltd., will operate to Arab countries, while the Jewish company, Palestine Airways, Ltd., will fly to European capitals.

YES COUNT THEM!... On your own field!... On nearby fields, at air shows, air meets, breakfast flights... Wherever you see airplanes on a line or in a hangar—count them. And don't forget to count how many have Sensenich propellers.

4 out of 5 of the propellers you count will have the Sensenich trade mark on the blades.

Sensenich is the world's largest manufacturer of wood aircraft propellers. Sensenich propellers are standard equipment on more new personal planes than any other. They are chosen more often for replacement than any other. Sensenich engineers are called upon to assist in the development of new type aircraft by designing new propellers for highly specialized requirements.

Sensenich PROP-SHOPS repair more wood propellers of all makes than any other company.

All this adds up to one thing: *you'll be happier if you keep a Sensenich propeller on the nose of* YOUR *ship.*

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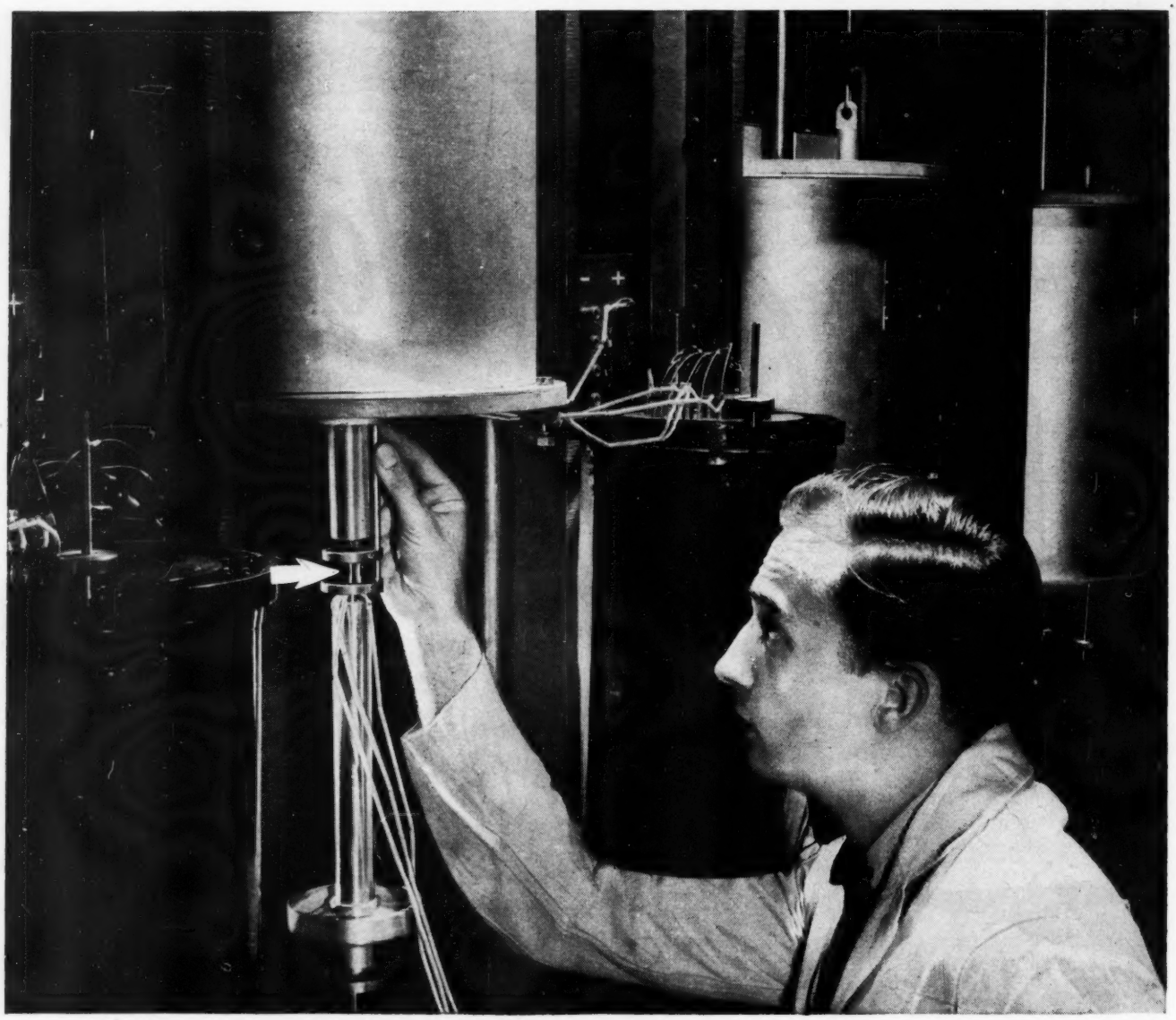
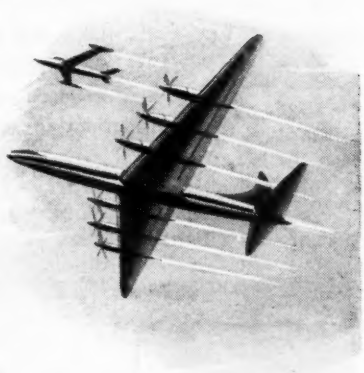


THE ALLOY THAT CREEPS BEFORE IT FLIES

▶ This metal alloy specimen is providing information for designers of aircraft engines. It is undergoing a high temperature "creep" test in the Wright Aeronautical Corporation metallurgical laboratory. For months at a time it will be stretched under a tension of thousands of pounds per square inch — at temperatures that will keep it white hot. The test machine can measure as little as 5/100,000 of an inch stretch and control the heat within a tolerance of one degree Fahrenheit.

▶ The "creep" test is conducted on hundreds of specimens to determine how much each will stretch when subjected to extreme loads and temperatures for thousands of hours. It preproduces conditions that the material will encounter in actual operation.

▶ Another example of the resourcefulness with which Wright Engineers pioneer developments in aircraft turbine and reciprocating engines.



POWER FOR AIR PROGRESS

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A DIVISION OF CURTISS WRIGHT FIRST IN FLIGHT

Vol. 48, No. 4

AVIATION WEEK

Jan. 26, 1948

T. P. Wright to Leave CAA Post For Cornell Air Research Group

Administrator will direct air laboratory and research foundation; Lee and Anderson are considered likely candidates for appointment to post.

Resignation of Theodore Paul Wright as Administrator of Civil Aeronautics lay on President Truman's desk last week, still unaccepted. It was understood Wright will remain in his post for several weeks to complete some current duties, before going to his new job as director of the Research Foundation of Cornell University, Ithaca, N. Y., including the Buffalo, N. Y., Aeronautical Research Laboratory.

Frederick B. Lee, deputy administrator of CAA, and former executive assistant to Wright, appeared the most likely choice within CAA to succeed Wright. Secretary of Commerce Averill Harriman has a preference for non-political aviation appointments. Lee has a long record as a New York attorney, private pilot, and as a Naval Aviation Administrator before coming to CAA.

Name of William A. Anderson, Pennsylvania state aeronautics director, and former president of the National Association of State Aviation Officials, was being mentioned in the aviation industry as another capable prospect for the CAA top post. Anderson is a member of the CAA's non-scheduled Flying Advisory Committee, and has made outstanding administrator's record in his own state for flying safety, air marking, airport construction, and other phases of aviation development work.

▶ **Triple Salary**—Wright's new Cornell job carries a salary approximately three times that of his CAA $10,000 annual stipend.

He has told friends that he felt he could no longer afford to remain in government because of the expenses connected with his job not covered by his salary. Wright has been continuously in Washington administrative posts since 1941, when he was named assistant chief, aircraft section Office Production Management. He was later named assistant chief, aircraft section, War Production Board, and still later became director of Aircraft Resources Control Office, WPB. In the fall of 1944 he was appointed to his present post.

T. P. WRIGHT

Before coming to Washington, he had a 20 year career in aircraft engineering and executive posts, first with the Curtiss Aeroplane and Motor Co., and later with its successor, Curtiss-Wright Corp., serving as vice-president of the latter company at the time he entered government service. As an engineer he is probably best known for his work in development of the Curtiss Tanager, a plane which won the $100,000 Guggenheim Foundation first prize in a 1929 competition. He also aided in development of many other military and civil aircraft.

▶ **Wright Policies**—Taking over CAA in the critical period of converting civil aviation to a postwar level, Wright set up liberal policies of regulation which were frequently ignored or short-circuited by some of his more reactionary "Old Guard" CAA subordinates. Despite this handicap, Wright can be credited however with liberalizing physical requirements for pilots, setting up an advisory committee on non-scheduled flying, appointing large numbers of flight examiners and factory inspectors from industry to take over the main burden of inspection duties from the CAA general inspectors, and other actions to promote personal aviation.

He sought to stimulate development of better personal planes, through CAA development contracts, but this proposal met with a chilly industry reception.

Wright also became involved in the stormy controversy between radar GCA and the VHF radio ILS, which found CAA technical men as sponsors of CAA-developed Instrument Landing System on the opposite side of the fence from a large segment of the aviation industry and congressional aviation leaders who preferred the World War II-developed Ground Control Approach radar system. Controversy thus far has resulted in double installations of ILS and GCA at many airports and congressional disapproval of further ILS funds.

Other factors besides the small CAA administrator's salary undoubtedly entered into Wright's decision to resign. Among these might be cited: a somewhat "fed-up" attitude about criticisms of CAA red tape and bureaucratic short comings, rarely aimed at the administrator, but rather at his "Old Guard" subordinates; an inclination to chafe under the civil aviation setup which leaves the administrator subordinate to two Commerce officials, the Secretary and the Assistant Secretary of Commerce for Air.

Whether Wright's departure may have any bearing on acceptance of the President's Air Policy Commission's recommendations for sweeping revision of the status of civil aviation agencies in federal government will be watched closely by observers.

▶ **Civil Air Department**—The Finletter commission recommended establishment of a Department of Civil Aviation under the Department of Commerce, with a Secretary of Civil Aviation, on the same administrative level as Secretaries of Air Force, Army and Navy. It called for establishment of independent Civil Aeronautics Board and Air Safety Board, to separate the handling of safety and economic regulations. Under the Department of Civil Aviation would be

set up four bureaus: federal airways, airports, safety regulation, and facilities planning. An Aircraft Development Corporation would be set up with a board of directors headed by the Secretary of Civil Aviation as chairman with the Secretary of the Air Force as a member, to finance development and purchase of civil aircraft and components.

Navy Has Two New Plane Types for '49

Bureau of Aeronautics procurement plans for 1949 remain tentative pending final appropriation determinations during the current Congress. Navy has already obligated funds provided for the purpose for continuation in production of the majority of aircraft slated for delivery during this year. Two new types, Vought F6U and Martin P4M, will go into production initially during 1949. Already committed to Bureau of Aeronautics procurement throughout next year are:

▶ **Fighters**—Thirty Chance Vought F6U-1 Pirate jet fighters, featuring smooth Metalite exterior structure and a Westinghouse 24C axial-flow turbojet engine; final 65 Grumman F8F-1 Bearcat propeller-driven fighters; final 89 Grumman F9F-2 Panther fighters and final 49 McDonnell F2H-1 Banshee twin-jet fighters are slated for completion during 1949. Definitely in the running for an expanded order carrying through 1950 is the Grumman Panther, which has rapidly become a high priority Navy production and development project.

▶ **Attack Plane**—Continuing well into 1949 production is the Douglas AD-1 Skyraider. Production of 123 during that year will complete a total quantity of 539 airplanes. This hard-hitting offensive weapon will comprise the Navy's carrier attack arm for the next several years in line with its tactical doctrine that once fast jet fighters have gained air control, propeller-driven attack planes are adequate and far more efficient for the clean-up job than jet attack planes might be.

▶ **Patrol Planes**—Last 30 Lockheed P2V Neptune patrol planes will be completed during 1949 as well as a small preliminary service test order for Martin P4M-1 Mercator combination jet and reciprocating engined patrol craft. Now being negotiated is an additional contract bringing the total order for this high-performance long-range search plane to 24, funds for which are already available. Next year will see completion of the current Martin PBM-5A amphibian contract with delivery of 12 planes, completing the 47 that are presently on order.

Lobby Probe Hits Airlines

With preliminaries on the investigation into alleged airline lobbies as well as other lobbying investigations under way by the Department of Justice nearing completion, Attorney General Tom Clark last week authorized his special assistant, Irving Kaufman, to follow through by summoning a grand jury.

According to Pan American Airways' vice president Sam Pryor, Justice approached PAA on the investigation with a letter stating that scrutinies were being made to determine possible lobbying by airlines. Justice Dept. completed an examination of PAA books. As yet no evidence has come to light on Justice Department scrutiny of any other carrier.

▶ **Seek Violations**—Justice's lobbying investigations are being made to unearth possible violations of the 1946 Congressional Reorganization Act requiring registration of lobbyists with the House clerk. A maximum penalty of $5,000 or imprisonment for one year, or both, is laid down for failure to register. No individual connected with Pan Am has registered as a lobbyist.

Howard Hughes made the charge last August, on the eve of a Senate investigation into his wartime plane manufacturing contracts, that Sen. Brewster (R., Me.) had used his political position to further the interests of Juan Trippe and PAA. When requested by Kaufman to present testimony, Hughes said that Noah Dietrich, TWA vice president, would be better qualified.

It is understood that Hughes prefers to present his evidence to the Justice Dept. on the West Coast where his activities on his giant flying boat and electronics research have kept him too busy to make another trip to Washington "convenient."

If Hughes presents his formal complaint to the Justice Dept. the Brewster matter will not be dropped without further explanation. Indication that Hughes may press the charge came in the Washington appearance of Dietrich, early in January, as a witness in the case. Dietrich presented secret testimony to the Justice Dept.

In a letter to Brewster on Oct. 21, Kaufman stated "if you . . . will advise us by letter that it is your desire to withdraw your request for an exploration by the Justice Department [of Hughes charge] . . . the exploration requested by you will not be undertaken." Brewster subsequently denied that he had requested the "exploration," but had stated only that if a complaint making the charge were filed by Hughes he "would welcome and invite exploration."

"You will observe that in the published statement of Mr. Hughes he states that he proposed to present his complaint to you as attorney general for investigation," Brewster wrote. "You will note that in my public statement I stated that I would 'welcome and invite exploration' of his charge by you." It was as a follow-up to this declaration that Justice invited Hughes to file a complaint.

Justice's investigation of PAA lobbying is taken in some quarters as a countermove to the Republican move in the Senate to investigate the Justice Department for an alleged "whitewash" of frauds claimed in last year's Democratic primary in Kansas City. The frauds involved Enos Axtell, President Truman's choice to replace incumbent Democratic Congressman Roger Slaughter. Justice investigation was demanded last year by Republican members of a judiciary subcommittee, headed by Sen. Homer Ferguson (R., Mich.). Filibustering Democrats blocked authorization for the investigation during the closing days of the last session. Republicans placed the authorization as the top order of business for the new session. During the first two weeks of this session, however, no action has been taken. Ferguson was chairman of the war investigating subcommittee which heard Hughes' charges against Brewster last August. He was appointed to the post by Brewster, chairman of the full War Investigating Committee.

Loran Bill

Legislation authorizing the Coast Guard to establish and operate air safety facilities, both within the United States and overseas, for the Air Force and Naval Aviation has been introduced recently in the legislative chamber, by Sen. Wallace White (R., Me.), chairman of the Senate Interstate and Foreign Commerce Committee.

IAS Honors Night Features Meeting

Honors Night Dinner of the Institute of the Aeronautical Sciences at New York City's Hotel Astor, Jan. 26, climaxes the first sessions of the four-day annual IAS meeting. Featured with the presentation of annual awards will be a speech by Thomas K. Finletter, chairman of the President's Air Policy Committee.

During the meeting, John K. Northrop will be inducted as the new Institute president.

Top event of the first evening will be the presentation of the Sylvanus Albert Reed Award "for notable contribution to the aeronautical sciences resulting from experimental or theoretical investigations, the beneficial influence of which, on the development of practical aeronautics, is apparent." Recipients are two Bureau of Standards aerodynamicists, Dr. Galen B. Schubauer, and Dr. Harold K. Skramstad, "for important contributions they have made to the art of measuring turbulence, and the study of boundary layer flow."

Highest pilot honor, the Octave Chanute Award, will be given to Lawrence A. Clousing, head, flight section, Ames Aeronautical Laboratory, National Advisory Committee for Aeronautics, for "research on various airplanes at very high speeds, enabling measurement of compressibility effects on stability, control and structural loads at very high Mach numbers."

In the field of aviation medicine, the John Jeffries Award goes to a Canadian, Dr. J. Winfred Tice, cited for "outstanding contributions to the advancement of aeronautics through medical research."

Col. Benjamin G. Holzman, ranking meteorologist on the staff of the U. S. Air Force of Research and Development, will be the 1947 recipient of the Robert M. Losey Award. Holzman's citation states, "In recognition of outstanding contributions to the science of meteorology as applied to aeronautics."

The Lawrence Sperry Award will be presented to Commander Noel Arthur Meredyth Gaylor, USN, executive director, Special Devices Center, Port Washington, N. Y. Commander Gaylor was cited for "outstanding contributions to synthetic training methods and devices in the field of aviation."

James H. Doolittle, vice president and a director of Shell Union Oil Corp., a past-president and fellow of the Institute of Aeronautical Sciences, will become an Honorary Fellow of the Institute—the highest honor of IAS.

Lewis Feted

Dr. George W. Lewis, for 28 years NACA Director of Aeronautical Research and now NACA research consultant, has been honored by a testimonial signed by the 15 members of the Committee in tribute to his exceptionally meritorious service to his country. Joining the NACA in 1919 when it had one small wind tunnel and 43 employes, Dr. Lewis pioneered in the design and construction of special research equipment and was the first to use variable density, full-scale refrigerated, free-flight gust and high speed wind tunnels. He developed the three NACA research laboratories and coordinated a research staff that presently numbers about six thousand employes. Under his leadership the NACA has made scientific and technical contributions of inestimable value to the national security and to aeronautical science the world over.

Branch Leaves CAB; Kuter Out

Board reduced to two members by Harllee Branch resignation effective May 1.

The search for likely $10,000-a-year candidates for the Civil Aeronautics Board grew hotter last week as President Truman accepted Member Harllee Branch's resignation and a Senate committee for the second time refused to approve a special dispensation permitting Maj. Gen. Laurence S. Kuter to become board chairman.

Branch, whose resignation becomes effective May 1, told President Truman he wanted to leave the board because he was "quite tired." The 68-year-old CAB member added that the high cost of living in Washington makes it necessary for him to improve his personal situation.

▶ **Two Members Left**—Appointed to CAB in August, 1938, as one of the board's original members, Branch was vice chairman from then until July, 1940, and chairman from July, 1940, until Dec. 31, 1941. His present term expires Dec. 31, 1950. Branch's resignation left only two members who are planning to stay on with CAB—Vice Chairman Oswald Ryan and Member Josh Lee.

Meanwhile, the Senate Armed Services Committee again balked at President Truman's request that General Kuter be permitted to retain his Air Force rank and $15,500 annual pay while serving as CAB chairman. In standing pat on its original action (AVIATION WEEK, Jan. 19), the committee turned down a personal plea from the President.

The committee also rejected a compromise proposal backed by four Democrats. This plan would have permitted Kuter to serve one year (instead of the six-year term) with his military rank and salary.

▶ **Six Refused**—President Truman, in asking the committee to reconsider its stand, stated that he had offered the CAB chairmanship to more than six qualified men, but all had refused the post. The President observed it was extremely difficult now to get a good man for the chairmanship who is not involved in some way with commercial aviation.

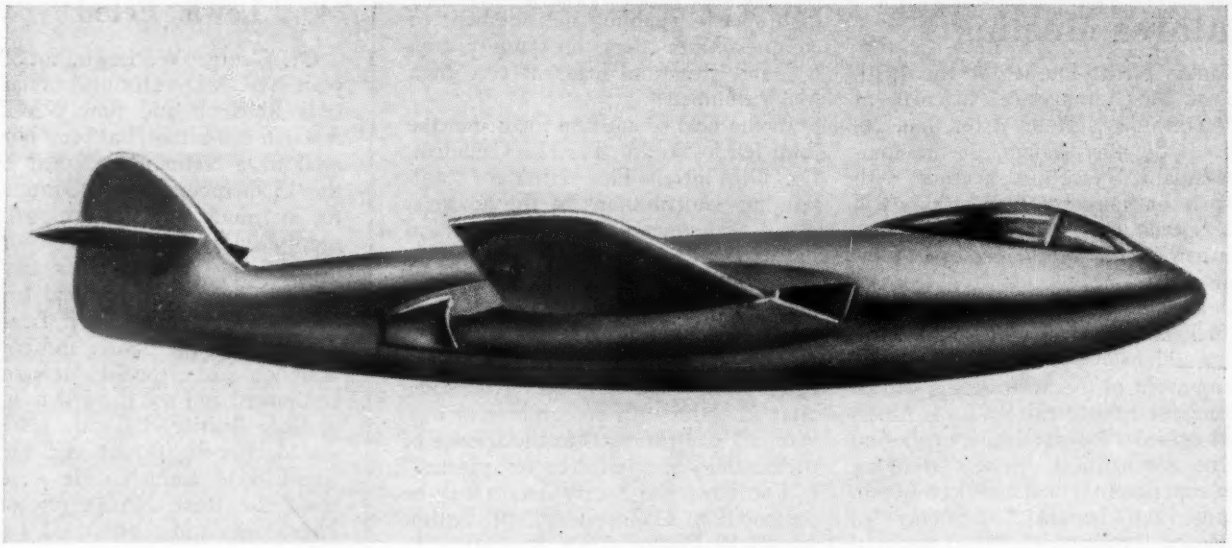
Following the Armed Services Committee's second rejection of special legislation covering the proposed Kuter appointment, President Truman said he had abandoned hope of putting the General into the CAB chairmanship.

U. S. Transport Groups Shape ICAO Policy

The U. S. position with respect to recommending changes in ICAO proposed airworthiness requirements was being formulated last week at a national conference of interested agencies in Santa Monica, Calif.

More than 50 key representatives of Aircraft Industries Assn., Air Transport Assn., Air Line Pilots Assn., and Civil Aeronautics Administration were in attendance under chairmanship of Ray B. Maloy, CAA flight engineering division chief. Discussions were in closed session during three days of conference with the probability that announcement of recommendations will be made prior to ICAO's decisive meeting in Montreal in September.

Reflecting British interest along a similar line, the Santa Monica conference concentrated on shaping proposals for ICAO that will anticipate the advent of turbine powered transports. Feeling of U. S. aircraft leaders seems to be that airworthiness requirements that will be set up for today's piston engine transports should be given such flexibility that they can be modified to cover turbine engine aircraft. ICAO may be asked to establish dual requirements for today's transports and the turbine transports of tomorrow, with particular reference to floors and ceilings of climb requirements and temperature accountability.



LATEST BRITISH JET FIGHTER

Hawker N.7/46, newest British jet fighter, made its first test flight recently and now has about three hours in the air. Shown above is an artist's sketch. This latest Hawker is powered by a Rolls Royce Nene with twin intakes and tail-pipes.

Nimitz Plugs Atom Bomb Carrier Planes

Atomic bomb-laden Navy carrier planes will spearhead attacks in the next war is the opinion of Fleet Admiral Chester W. Nimitz, retiring chief of naval operations. In a valedictory study of the future employment of naval forces, Nimitz thoroughly embraces air power as the basic future strength of the U. S. Navy, a combination of carrierborne aircraft and ship-launched missiles. Among other representations, he holds that:

"Aircraft carriers constitute the only air bases that can be made available near enemy territory without assault and conquest; they are mobile offensive bases that can be employed with the unique attributes of secrecy and surprise.

"The earliest warning of enemy air attack against our vital centers should be provided by naval air, surface and submarine radar pickets deployed in the vast ocean spaces which surround the continent.

"Protection of our cities against missile launching submarines can best be effected by naval hunter-killer groups composed of small aircraft carriers and modern destroyers operating as a team with naval land-based aircraft.

"It is improbable that bomber fleets will be capable, for several years to come, of making two-way trips between continents, even over the polar routes, with heavy loads of bombs. It is apparent then that in the event of war within this period, if we are to project our power against the vital areas of any enemy across the ocean before beachheads on enemy territory are captured, it must be by air-sea power; by aircraft launched from carriers and by heavy surface ships and submarines projecting guided missiles and rockets. If present promise is developed by research, test and production, these types of air-sea power operating in concert will be able within the next ten years critically to damage enemy vital areas many hundreds of miles inland."

Johnson Bill Seeks Funds To Implement Air Policy

Legislation indorsing the Air Policy Commission's recommendation for a 1948 calendar year Air Force budget of $4,150,000,000 and a 1949 budget of $5,450,000,000 was introduced last week by Sen. Ed Johnson (D., Colo.), an isolationist-inclined advocate of strong U. S. defense forces and a dissenter on foreign reconstruction spending as a means for securing peace for the United States.

The measure authorizes an "extra" appropriation for the national defense ("in addition to such sums as may otherwise be appropriated") of $2,000,000,000 for the 1949 fiscal year and again for the 1950 fiscal year, to carry out the recommendations of the Commission and "regain and maintain the supremacy of the U. S. in air power." Since the bill does not even authorize the $4 to $5 billion annual Air Force budget proposed by the Commission—let alone appropriate it, it is generally regarded as little more than fanfare to focus attention on the need for a strong air defense.

Ebel Leaves Martin For Curtiss-Wright

William K. Ebel, for 25 years an engineer with the Glenn L. Martin Co., most recently as vice president in charge of engineering, has resigned and accepted the post of Director of Engineering for the Airplane Division of the Curtiss-Wright Corp. Ebel combines the duties of designer and test pilot, having made the initial test flights in the Martin BM-1 dive bomber, the Martin B-26 Marauder bomber and the Martin XPB2M-1 "Mars" flying boat. Curtiss-Wright is presently engaged in flying missile and pilotless aircraft development work, in addition to regular research and production activities.

Succeeding Ebel as Martin engineering vice president is D. Roy Shoults, named chief engineer last June. Shoults was formerly engineering vice president of Bell Aircraft Corp. and an engineer for the General Electric Co. for a period of 20 years.

UAL-Pilot Pact

United Air Lines and the Air Line Pilots Association have reached an understanding on the disputed grievance machinery section of their new contract. The issue previously had provoked a strike ballot and walkout threat by the pilots. Signing of the new contract was believed imminent last week.

Waterman Probe Dropped

CAB's enforcement and litigation section has suggested that the Board dismiss Chicago & Southern Air Lines' complaint of Aug. 19, 1946, which asked for an investigation to determine whether Waterman Airlines (wholly-owned subsidiary of Waterman Steamship Corp.) was operating in violation of the nonscheduled exemption. The enforcement section noted that CAB on Jan. 14, 1948, accepted the surrender of Waterman's letter of registration as a nonscheduled carrier, adding that the operations complained against have been discontinued.

AVIATION CALENDAR

Jan. 7-30—Air Transportation Institute, American University, Washington, D. C.
Jan. 26—AIA aircraft technical committee, AIA office, Los Angeles.
Jan. 26-28—CAA non-scheduled operators of region four, Fort Worth.
Jan. 26-29—16th annual meeting, Institute of the Aeronautical Sciences, Hotel Astor, New York.
Jan. 26-30—American Institute of Electrical Engineers, Pittsburgh.
Jan. 27—American Road Builders Association, airport division, Washington, D. C.
Jan. 28—AIA patent committee, Manufacturers Aircraft Association office, 30 Rockefeller Plaza, New York.
Jan. 28—AIA Personal Aircraft Council, Hotel Statler, Washington.
Jan. 29—AIA Aircraft Manufacturers Council, eastern regional executive committee, Wings Club, New York.
Feb. 5—American Legion national aeronautical conference, Wright Field.
Feb. 6-7—American Legion national aeronautical conference, Indianapolis.
Feb. 13—Air Transport Command reunion, Waldorf Astoria, New York.
Feb. 16-17—Second annual Purdue Airport and Fixed Base Conference, Purdue University, West Lafayette, Ind.
Feb. 17-19—ATA meteorological committee, Peabody Hotel, Memphis.
Feb. 26-27—Louisiana Aviation Conference, Shreveport.
Mar. 8.—ICAO maps and charts division, Brussels.
Mar. 22—ICAO areonautical maps and charts division, Brussels.
Mar. 26—National Flight Propulsion meeting, Institute of the Aeronautical Sciences, Hotel Carter, Cleveland.
Mar. 30—ICAO personnel licensing division, Montreal.
Apr. 1-3—American Institute of Electrical Engineers, Des Moines.
Apr. 4-8—American Association of Airport Executives, Congress Hotel, Chicago.
Apr. 20—ICAO rules of the air and air traffic control division, Montreal.
Apr. 27—ICAO facilitation division, Europe.
Apr. 28-30—American Institute of Electrical Engineers, northeastern district meeting, New Haven, Conn.
June—Second ICAO assembly meeting, western Europe.
June 1—ICAO second assembly, Palais Des National, Geneva, Switzerland.
June 21-25—American Institute of Electrical Engineers, summer general meeting, Mexico City.
July—International Air Exposition, Idlewild Airport, New York.
July 15—Ninth annual meeting, Airline Advisory Board, Kansas City, Mo.
July 31—International Air Exposition, Idlewild Airport, New York.
Aug. 24-27—American Institute of Electrical Engineers, Pacific general meeting, Spokane, Wash.
Sept. 2—International Aeronautic Federation, Cleveland.
Sept. 3—International Aeronautic Federation, Cleveland.
Sept. 4-6—National Air Races, Cleveland.
Sept. 8—ICAO operations division, Montreal.
Sept. 21—ICAO airworthiness division, Montreal.
Oct. 5-7—American Institute of Electrical Engineers, middle eastern district meeting, Washington.

INDUSTRY OBSERVER

► **New flying boat development is waiting for perfection of turboprop engines, according to C. H. (Dutch) Schildhauer, former NATS commander and Panam executive. With turboprops it will be possible to build a 260,000 lb. flying boat that can carry a 55 percent useful load—about 10 percent better than any landplane. This giant boat will cruise at 300 mph. at 30,000 ft. and carry a 40,000 lb. payload for 5,000 mi.**

► General Carl A. Spaatz has set Jan. 1, 1949, as the earliest possible deadline for the Air Force to reach a strength of 70 groups, provided funds are available. He also discussed Russian aircraft production in great detail both qualitatively and quantitatively during executive sessions of the President's Air Policy Commission.

► **Piper Aircraft Corp. is scheduled to resume production around Feb. 1. Price on its new four-placer will be between $4,000 and $4,500.**

► Edo has completed its production order for 10 XOSE-1s for the Navy. Most of the planes have been delivered to Patuxent.

► **Douglas Aircraft Co. has completed seven C-74s for the Air Force but deliveries have been delayed by changes on the Pratt & Whitney R-4360-49 engines involving a boost of power from 3,000 hp. to 3,500 hp. Five C-74s will go to Air Transport Command and two to Air Materiel Command.**

► Work is well under way on the Saro SR45 giant flying boats at Cowes, England. They will be powered by 10 Proteus turboprops.

► **Boeing President William M. Allen estimates that seven years may be required for complete development of Boeing's sweptwing, six engined jet bomber.**

► Lockheed's second Constitution may not fly for several months. While construction is progressing, and the airplane structurally is complete, it still must receive engines and other accessory components. The No. 1 Constitution, still under factory test but nearing the time when it will be turned over to Navy for service testing, returned to the air Jan. 9 with a takeoff run of no more than 1800 ft. although loaded to 165,000 of its 184,000 lb. designed gross weight.

► **Curtiss-Wright test pilot Lee Miller will fly the four jet XP-87, experimental all-weather fighter, on its initial flight tests. Assembly of the XP-87 has been completed at Muroc and ground tests have begun by Air Force personnel preparatory to Miller's first flight.**

► Navy GCA unit at Seattle registered its 10th emergency save last week, guiding nonscheduled commercial airliners to landings in below CAA minimum weather when all other available alternates were closed by weather. Trans-Alaska DC-3 was landed with 300 ft. ceiling and 2 miles visibility and a Totem Airlines PBY-5A landed with 200 ft. and 1 mile. Both carried passengers from Alaska including two emergency hospital cases.

► **Both Navy and Air Force plan to continue aircraft "de-mothing" operations until 1950 at which time it is estimated that present aircraft storage stocks will be exhausted.**

► Secretary Symington of the Air Force believes at least six to eight aircraft companies with adequate engineering departments are necessary for Air Force procurement. Symington's revision of Air Force procurement policies spearheaded by Undersecretary Arthur Barrows is aimed at establishing negotiated contracts as peacetime procurement procedure and eliminating sealed bid competitive procedures. Air Force is also considering methods by which unsuccessful firms in design competitions can be given subcontracts on successful design production orders.

► **First Australian-built Rolls-Royce Nene turbojet engine is scheduled for completion and test in June. Produced by Commonwealth Aircraft Corp., Melbourne, the engines will power Australian-built De Havilland Vampire jet fighters.**

► Avions Marcel Dassault is building a Dassault 450 which closely resembles the Douglas D-558 in external lines. It is a combat fighter powered by a Rolls-Royce Nene turbojet engine and armed with four 20-mm. cannon. Its top speed is estimated at 578 mph. Dassault is an independent company in the socialized French aircraft industry.

ENGINEERING & PRODUCTION

Long Range Procurement Plans Suggested for Aircraft Industry

Air Policy Commission sees gearing of manufacturers to 70-group Air Force plan, production of essential military aircraft, as answer to financial plights.

Gearing the aircraft manufacturing industry directly into the Air Force 70-group plan, providing for long-range (five year) procurement and integrating mobilization planning into the aircraft production system will, in the opinion of the President's Air Policy Commission, provide a sound aircraft industry structure on which to base our national defense.

If the aircraft manufacturing industry can be permitted to produce that quantity of military aircraft (30-40 million airframe pounds annually) deemed essential to support the national security, its financial problems ($85 million loss in 1946, $80 million loss in 1947) will be solved and the minimum production level required for rapid expansion in an emergency will be maintained, the Commission believes.

▶ **Planning Problem**—The Commission feels strongly that the major problem of the industry since the war (as well as in pre-war years) has been a lack of planning on the part of the procuring services. To a large extent this has resulted from restrictive legislation, which has prevented such planning in the past. The Commission recommends that these barriers be removed. Competitive bid procurement system, long used by both services, must be modified to permit losing bidders to remain in the procurement picture and to prevent the concentration of business in certain strong companies. Such planning would obviate the violent and extremely costly fluctuations in production levels in individual companies and simultaneously preserve valuable design and production teams for future contracts.

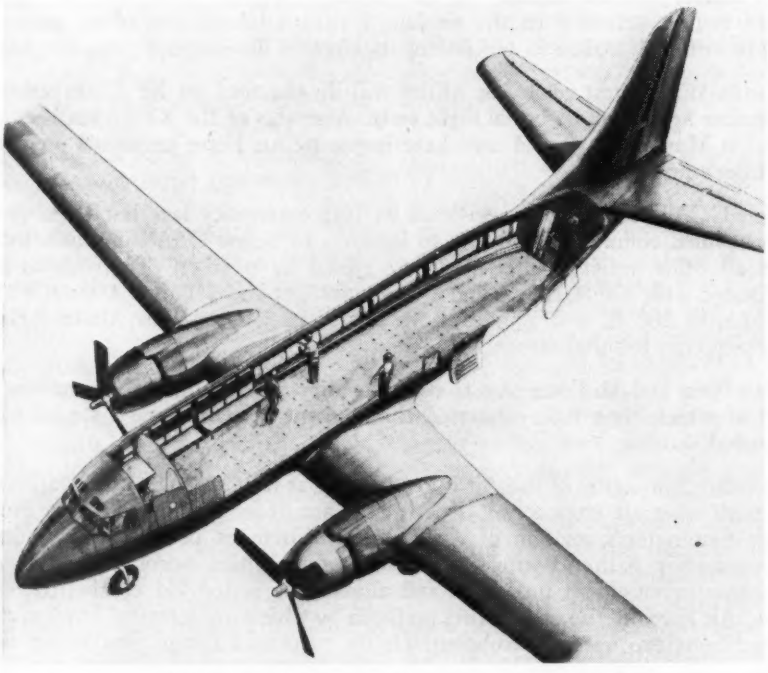
At the root of this problem is the practice of the government to provide funds only for a single fiscal year. Past experience has shown that new aircraft, growing increasingly complex, cannot be developed to a production stage in a period of less than three-five years. An economy-minded Congress has inadvertently destroyed important new aircraft designs mid-way through the time-taking research and development phase. Commission urgently recommends that the Congress provide the Air Force and the Bureau of Aeronautics with forward contract authorizations for five year periods (instead of the current two fiscal years). Congress should retain its control over such money through its annual appropriations provided for the liquidation of such contracts. The services would be charged with integration of specific two-, three- or four-year programs into such overall five-year plans.

▶ **Mobilization Plans**—Commission believes that industrial mobilization planning should be given the same policy status as research, development and procurement within the services because of its vital reduction in the time required for the acceleration of production in emergency and accompanying reduction in required combat aircraft reserves. It rejects testimony for civilian control and recommends career officers with the same opportunity for advancement within the service as line officers. Complete production plans (including subcontractors, bills of material, tooling, schedules, etc.) for placing at least one model of each basic type of aircraft into production in a reserve plant should be prepared and kept up-to-date and plans for acceleration of production rates for current models be prepared by contractors for emergency use.

With such mobilization planning should go provisions for effectuation of such plans in the middle of a fiscal year through the declaration of an emergency by the President and immediate approval of such expenditures by the Congress. This plan would require inclusion in each annual budget of a figure representing such expanded production which, although not intended for passage at the time, would be approved by the Congress for immediate passage in the event of an emergency during the ensuing fiscal year.

Detailed recommendations of the Commission include:

• **Development Contracts**—Due to the large unknowns inherent in aeronautical research and development, the cost-



MILITARY MARTIN 2-0-2 OFFERED

Cutaway artist sketch of a military cargo version of the Martin 2-0-2 transport is shown here with 6 ft. by 8 ft. loading doors. As a military transport, 40 fully equipped combat soldiers can be carried. A hospital version accommodates 36 litter patients and four medical attendants. The craft can carry a 5¼-ton payload and 1,550 gallons of fuel, sufficient for a 1,760-mile range. Commercial airline version of the 2-0-2 has been demonstrated to Air Force, Navy and Marine Corps officers at Wright Field and Washington National Airport.

plus-fixed fee contract should be used. In addition, the contractor should be permitted to retain certain design rights to his inventions as an incentive and the long-established practice of procurement contracts including all rights be abandoned.

• **Production Contracts** – Incentives should be provided for the manufacturers to produce at low unit costs and low prices. Where high-volume tooling is used for low-volume production, the additional cost of such tooling should be entered as mobilization planning costs and so handled by the services.

• **Procurement Continuity**—To provide continuity of effort, each manufacturer should be permitted to have one type in quantity production, one in the development stage and a new experimental design under study at all times. The types in such process should be determined by the needs of the services and the individual skills of the manufacturer. Generally, the production contract should be awarded to the developing company in order that it be responsible for all subsequent design changes. Where such production contracts would overload the capacity of a given firm, the services should require that a substantial portion of the work be subcontracted and the parent firm provide all necessary engineering assistance and design changes to the subcontractor to enable the latter to produce the design economically and efficiently.

• **Production Dispersion**—The services are urged to avoid further production expansion in the current concentrations of capacity on the east and west coasts and to encourage the use of the presently dispersed reserve plants.

• **Reserve Capacity**—No further losses of reserve aircraft and engine plant capacity should be permitted and the present 21,200,000 square feet of airframe plant and 11,700,000 square feet of engine plant be maintained for continued availability. The program for the acquisition and storage of 65,000 general purpose machine tools should be completed.

• **Civilian Overhaul**—The overhaul of military aircraft under contract with civilian agencies trained in this work should be encouraged by the services because of savings in the cost of such work and the training and equipping of such civilian groups for use in emergency.

NWA Sees Good Year

Northwest Airlines President Croil Hunter has predicted that revenue passengers on NWA's domestic routes may increase 50 percent from 660,000 in 1947 to 1,000,000 in 1948. Previously, American Airlines had forecast a 17 percent increase in revenue.

Piasecki Names Rupert Materials Manager

Piasecki Helicopter Corp., Morton, Pa., has appointed Brestle A. Rupert material manager of the manufacturing division and he will be responsible for procurement and planning. Under his direction will be sub-departments on material control, production control, purchasing, subcontracts and stores.

Rupert's appointment was made necessary by the company's continued expansion and emergence as an important producer of service helicopters rather than as an organization concerned mainly with research. He formerly was purchasing agent for Fairchild and at one time in his 20 year-career in aircraft manufacturing was production manager at Martin.

In other personnel actions:

▶ **Glenn L. Martin Co.** named Dr. Karl Kammermeyer manager of research and development of the chemicals division at the Baltimore laboratory. Dr. Meyer H. Danzig was appointed director of research. E. H. Sorg, previously head of products research, became Kammermeyer's assistant, and S. N. Greene will take over Sorg's former duties. A. M. Stover, formerly in charge of compounds and process development, has been appointed director of development.

▶ **Goodyear Aircraft Corp.** has added John B. Rieker to its sales staff. He will be special representative for the company's lighter-than-air interests with headquarters at Akron, Ohio. Rieker is a veteran airship pilot with over 6,500 hours in blimps and free balloons.

▶ **Curtiss-Wright Corp.** appointed Kenneth P. Schmidt, manager of the industrial relations department of Wright Aeronautical Corp., Wood-Ridge, N. J. Schmidt joined the corporation in 1942, previously having been associated with the Manufacturers Trust Co. of New York, for more than ten years.

▶ **General Electric Co.** named Robert L. Gibson, manager of the newly created personnel division of the chemical department which has responsibility for matters pertaining to employee relations, union relations, community relations and educational activities in the various divisions and plants of the department. Gibson will also continue as manager of the advertising and sales promotion division. He will be assisted by Everett W. Bickford, manager of union relations, George M. Hartley, supervisor of planning and preparation, Karl B. McEachron, Jr., manager of educational activities, and Arthur G. Sanford, manager of personnel services and safety.

▶ **General Controls Co.** appointed Don. S. Bentley, factory branch manager at Los Angeles. Bentley has been with the company for some time as factory sales supervisor. He will direct his efforts to further the company's sales and service in the following states: Southern California, Arizona, sections of Nevada, New Mexico, and Texas. The company also appointed F. E. Weldon as factory branch manager of their New York office; and C. G. McCarthy as their Detroit factory branch manager.

▶ **SKF Industries, Inc.** appointed John H. Tipton, assistant district manager the Cincinnati office; M. H. Courtenay, assistant district manager of the Atlanta office; and E. A. Hutson, field engineer in the railway sales department of the Chicago office.

▶ **John A. Roebling's Sons Co.** appointed E. George Hartmann, general sales manager. Hartmann has been associated with Roebling since 1940 and has had over 29 years experience in the wire field.

▶ **United States Plywood Corp.** appointed J. Thomas Arens, manager of the branch warehouse at Baltimore, Md. Arens was formerly corporation salesman in Philadelphia. He replaces T. S. Hauck, who has been promoted to special field contact representative.

CIO Tells Aviation New Wage Demands

Aircraft and airframe management having contracts with the United Automobile, Aircraft and Agricultural Implement Workers, CIO, has been served notice by the union's international executive board of new demands for wage increases and other economic benefits expected when current contracts expire.

Topping the list is a demand for a 25-cent hourly wage increase which the UAW-CIO estimates will be necessary by May to restore the workers' "buying power" to what it was in June, 1946, when Congress relaxed price controls. As a precautionary measure, local unions have been advised, when beginning negotiations, to reserve the right to revise the demand upward if the cost of living between now and May rises more rapidly than the union contemplated.

The UAW-CIO 1948 third-round wage program contains three other demands: (1) an increase of 5 cents an hour for hospitalization, health, medical and surgical insurance; (2) guaranteed weekly wage; and (3) three weeks' paid vacation after five years of service.

Requests for pension plans were left to the discretion of local unions or groups of locals dealing with individual corporations. At General Motors, the UAW-CIO will ask that 10 cents of the 25-cent hourly increase be applied to a retirement plan.

New Engineering Service

A new aspect of aircraft engineering service to foreign airlines, relieving them of the costs of maintaining resident representatives at U. S. factories producing their transports, is disclosed by a Los Angeles engineering group.

Cloyd Smith, head of Masco Engineering Service, 2119 Sepulveda boulevard, has begun circularizing foreign airline companies with a carefully-planned proposal to represent them during development of transports now on order with major plane builders. His firm presents, on a sliding scale, a per-hour fee of work done for the airline for periods of from 5-hr. (minimum) per month to 140-hr. and up per month. Services offered include: aircraft inspection; expedition of parts; witnessing special tests; preparation of technical reports; supplying data on new designs; checking changes with C.A.A. and manufacturer, procurement of prints.

Rocket Researchers Sift Fuels To Reduce High Consumption

Nitric acid seen offering distinct advantages on basis of specific consumption by weight and by volume . . . Various fuels are evaluated.

By ROBERT McLARREN

Tremendous fuel consumption of the rocket motor (for example, 14.5 lb. of fuel per lb. of thrust per hr. in the V-2) poses the major rocket research problem. Attempt at its solution has taken several general paths since the rocket became a major military weapon. One of these is the utilization of high energy fuels, which produce a maximum heat from a minimum weight.

On the basis of high specific impulse (pounds of thrust created per pound of fuel burned per second) a mixture 20 percent liquid hydrogen and 80 percent liquid oxygen produces a specific impulse of 350 sec.—highest of the rocket fuels generally available. However, specific impulse is only one criterion for use in the selection of a rocket fuel. Of equal or greater import are the density and volume of the fuel, exerting a direct influence on the size of the rocket-propelled missile and the weight and complexity of the various parts of its fuel system. It is in this consideration that nitric acid warrants close study.

▶**Fuel Comparisons**—A study of nitric acid as a source of oxygen for a rocket fuel in comparison with liquid oxygen (generally in use in current U. S. rocket motors) and peroxide (used as the V-2 turbine drive and in the ME 163 Walter rocket motor) was made by Helmut Zborowski of the German Academy of Aeronautical Research, a translation of which by the National Advisory Committee for Aeronautics is now available.*

On the basis of the total heat liberated, liquid oxygen is 47 percent better than nitric acid and 56 percent better than peroxide when burned with a liquid hydrocarbon. However, more than 35 percent of the energy of the liquid oxygen is lost through dissociation, more than twice the loss of nitric acid fuel and more than four times that of peroxide fuel. In addition, another 13 percent is lost through vaporization, a total heat loss of 48 percent of the liquid oxygen fuel.

Thus, of the total 2,500 kg. cal./kg. of energy liberated by combustion of liquid oxygen and a liquid hydrocarbon, only 1,300 kg. cal./kg. are available as kinetic energy in the nozzle jet of the rocket motor. By comparison, a nitric acid-hydrocarbon rocket fuel provides 1,080 kg. cal./kg. as kinetic energy, a difference of only 10 percent in the two fuels.

▶**Nitric Acid Advantages**—It is on the basis of specific consumption by weight and by volume that the superiority of nitric acid is advanced. The consumption of liquid oxygen in a rocket engine operating at 35 atmospheres pressure is 6.3 kg./ton sec. compared with only 4.6 for a nitric acid fuel. On a volume basis, oxygen is consumed at the rate of 6.3 liters/ton sec. while nitric acid is used at a rate of only 3.35 liters/ton sec.

Practical significance of this lower volumetric consumption lies in the greatly increased heating energy which can be stored in a missile of a given frontal area, using nitric acid as a source of oxygen rather than liquid oxygen. Assuming a ballistic loading per unit area of 0.3 kg./sq.cm. and a propellant weight to takeoff weight of 0.4, the nitric acid missile would have a range more than 17 percent longer than the liquid oxygen missile.

Other significant advantages of nitric acid as an oxygen source for rocket motors include wide availability, desirable ignition behavior, advantageous freezing point of −42 deg. C., ease of obtaining complete combustion, stable structure eliminating spontaneous decomposition, ease of transportation and storage, and a low vapor pressure. An important consideration is the fact that a wide variety of readily available hydrocarbons and other organic compounds capable of ready reaction with nitric acid have been developed and many of them tested. Spontaneous reacting propellants eliminate the need for an ignition system within the rocket motor, thereby further simplifying its construction and cost.

▶**Objections Analyzed** — Wide-spread objection to nitric acid as a highly corrosive fuel requiring special metals or ceramics for handling has been based on the use of aqueous solutions. The water present acts as a catalyst enabling the acid to attack contacting metals. In a rocket fuel, only a highly concentrated nitric acid is used, the freedom from water preventing corrosion. Nitric acid in this concentrated form causes metals which are otherwise readily oxidizable, to become passive and prevent corrosive action. Iron possesses this characteristic as does aluminum and chromium in progressively greater degree. However, this balance of characteristics makes mandatory the use of moisture-proof containers for storage, as moisture-laden atmosphere would dilute the contents and initiate an acid-metal action. Ceramic materials, such as porcelain, glazed stoneware, baked enamels, and glass are impervious to nitric acid in even diluted form.

Another objection to nitric acid, its toxic danger to personnel, exists only at comparatively low temperatures, when it combines with oxygen from the atmosphere to form nitrogen dioxide poison gas. However, at combustion chamber temperatures above 1,600 deg. C., practically complete decomposition of the nitric oxides takes place.

▶**Nitric Fuels Improved** — Improvements in nitric acid rocket fuels have already been demonstrated as feasible: By dissolving nitrogen dioxide and nitrogen pentoxide in nitric acid, the density of the latter can be raised from 1.52 to 1.62, the volumetric fuel consumption lowered 6½ percent, and the gravimetric consumption lowered 2½ percent. These factors also lower the freezing point and improve the ignitability of the fuel.

Addition of a four percent by weight of iron trichloride can produce a substantial reduction in the ignition delay time, which has already been demonstrated to be only one thousandth of a second. This fast ignition, if further improved, may permit the design of intermittent rocket engines, a long-sought configuration with vastly increased range over present designs.

REFERENCE

*Zborowski, Helmut: Rocket Power Plants Based on Nitric Acid and Their Specific Propulsive Weights. NACA TM 1145.

STEEL DATA

The Engineering Data Book Sheet D-43, "Principle Applications of Aircraft Alloy Steels," published in AVIATION WEEK, December 22, 1947, was based on material compiled by L. C. Boyd, Alloy Service Metallurgist, of the Carnegie-Illinois Steel Corporation. This information was inadvertently omitted due to space exigencies.

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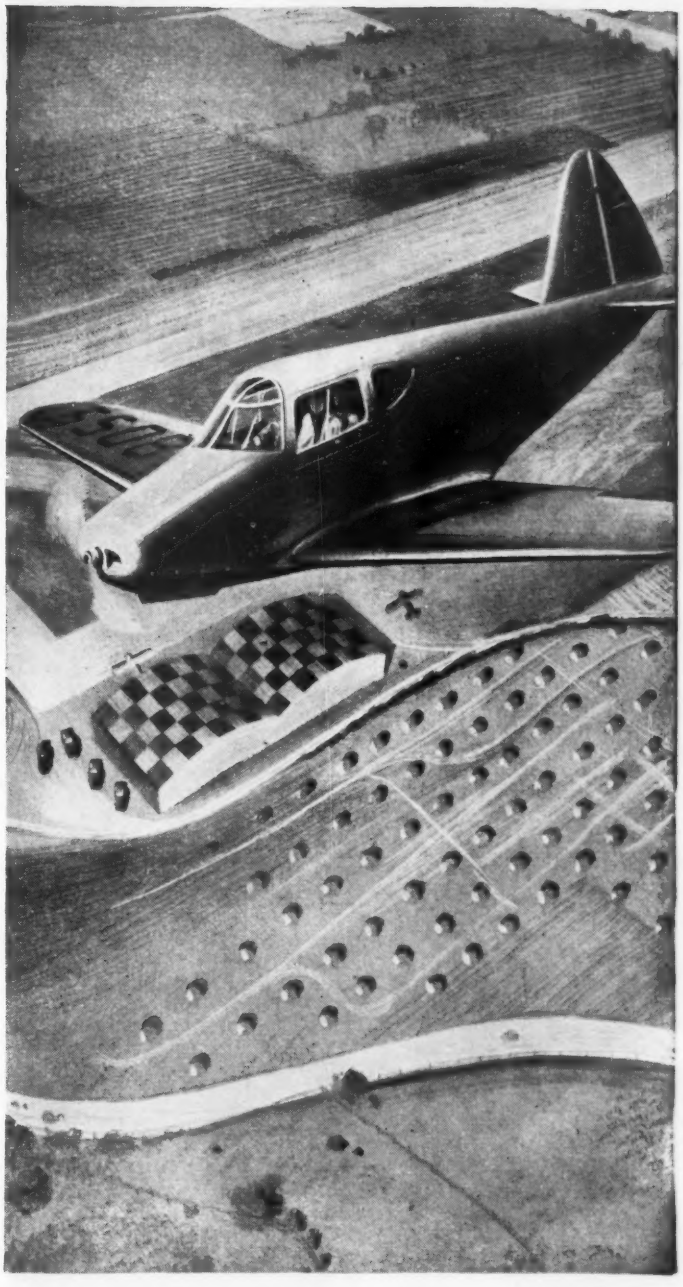

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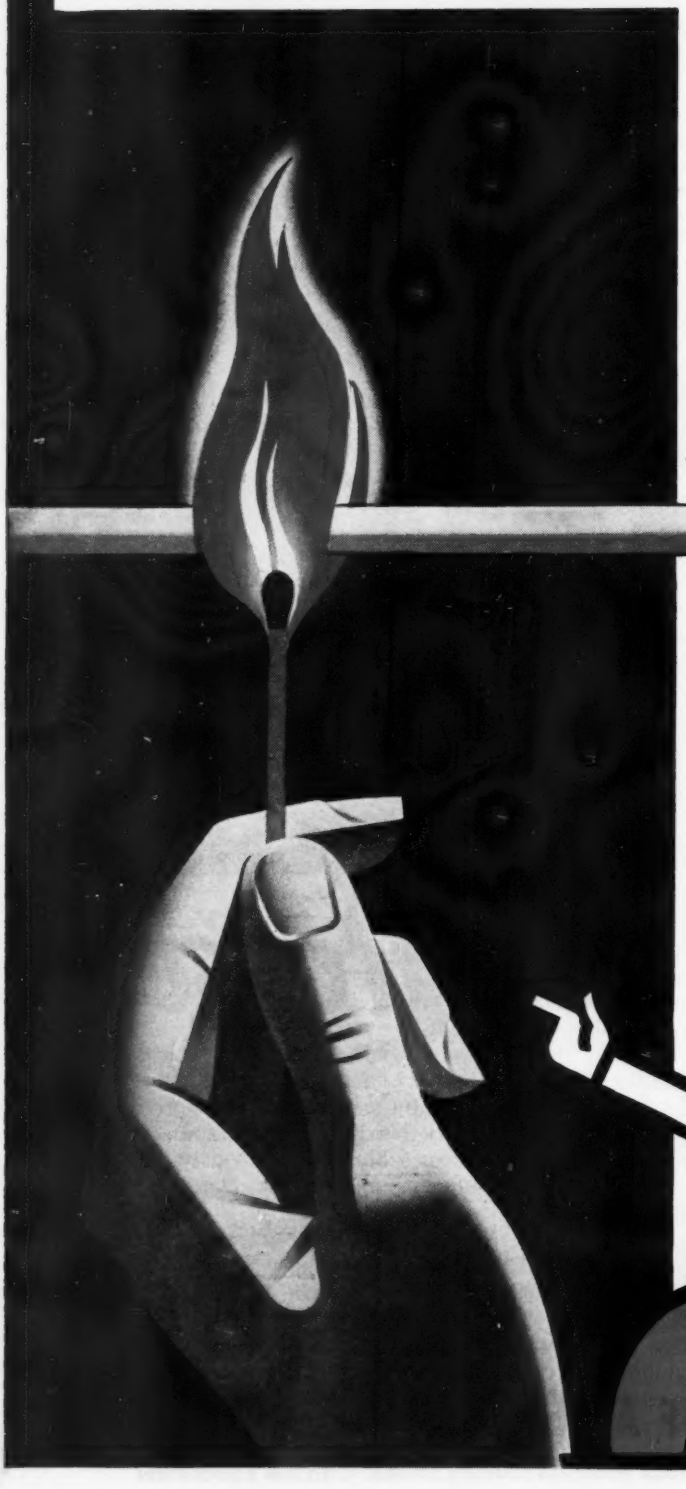

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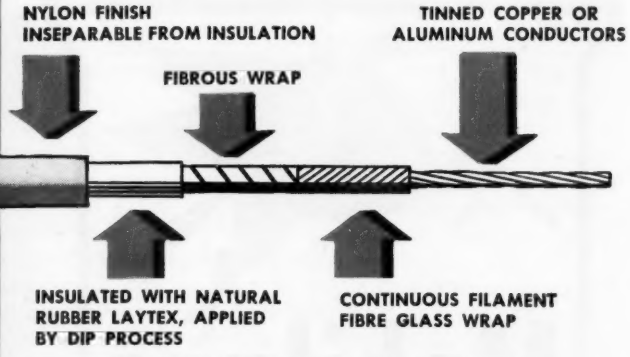

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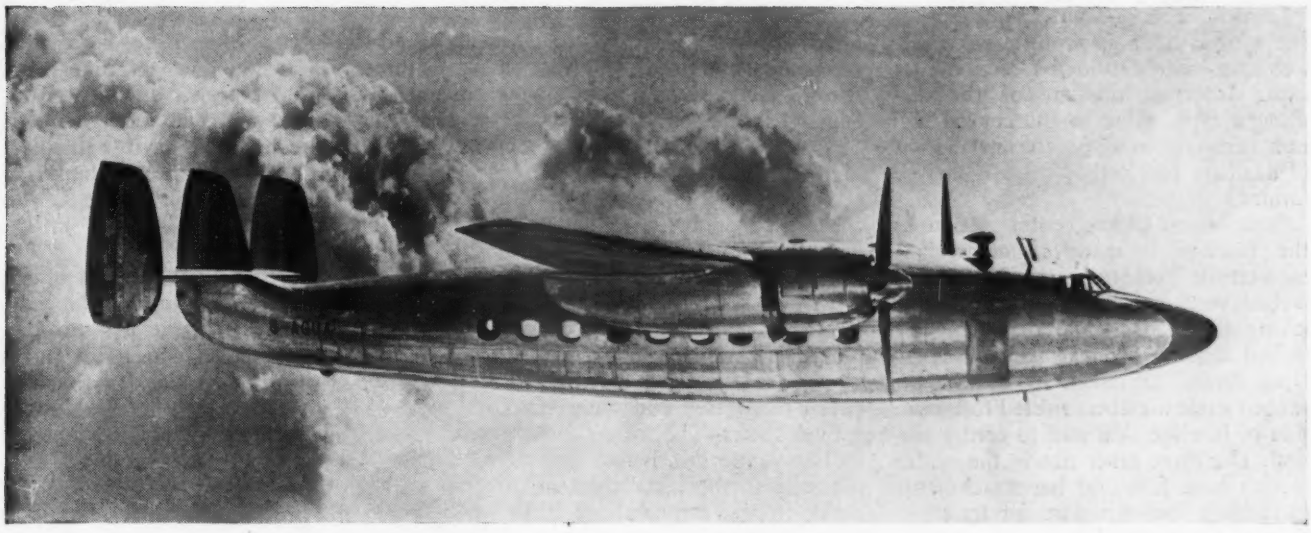


Airspeed Liner New Export Rival

Competing with U.S. makers, British company produces versatile high-speed plane featuring advanced engineering refinements.

By ALBERT E. SMYSER, JR.

British European Airways' announced intention to order from 20 to 30 Airspeed Ambassadors, puts this once "ugly duckling" of the British Ministry of Supply and Production well in the forefront of the race for orders from airlines on the Continent.

Featuring high cruising speed together with reported fundamental advantages for the operator and passenger, and various seating arrangements from 28 to 48 passengers in both pressurized and unpressurized versions, the Ambassador may well prove to be a serious rival in export sales of the American twin-engine transports now in that market. (Consolidated Vultee already has European orders for its Convair-Liner.)

▶ **Design Considerations** showing current trends in English aircraft engineering are reflected in this British transport.

The large span, low drag wing of the Ambassador is said to be one of the main factors in the achievement of its high economical speed. Wing is of greater aspect ratio (11) than has been customary, yet it has quite a moderate thickness-chord ratio at the root.

With high performance aircraft, one of the designer's greatest problems is that of obtaining the necessary span for a reasonable structure weight while maintaining minimum root thickness. The half-span to root thickness ratio or "overhang" ratio, probably has a greater influence on the relative efficiency than any other single factor.

Since the Ambassador's wing has been designed to retain a high proportion of laminar flow, a very rigid skin surface was needed, and the structural requirements linked up well with those required to keep the overhang ratio at a high figure. Skin flexing can only be avoided by the use of a thick and well-supported surface, and it was considered that it would be wasteful to cover a wing in this manner unless the skin structure itself was used to a maximum extent in dealing with bending and torsional stresses.

In this wing, skin thickness and stringer-pitching have been carefully graded along the span, and the skin, with its stiffeners, takes some 90 percent of the bending loads at the root end of the outer wing. An overhang ratio of 21.2 has been attained.

By preserving laminar flow far back toward trailing edge, a very low level of profile drag has been achieved. Here the advantage of the twin engine layout, in combination with a large span, can be seen; the region of disturbed air behind the propeller arcs representing only 30 percent of span.

Cleanness of form and smoothness of skin have been emphasized. Many refinements of detail reduce unnecessary drag.

It is believed that the slightly increased constructional costs will, when spread over five years or more of operation, be offset by added revenue-earning miles covered at the greater speed—quite apart from the value of this speed itself—since high utilization and aerodynamic efficiency is usually reflected by lowered costs.

Considering the component parts of the plane, various design characteristics were found to embody interesting details.

▶ **Fuselage**—Structurally, the pressurized fuselage is of conventional form, with skin stiffened by built-up frames and stringers. Majority of the stringers are Z-section pressings, but are separated, in groups of four, by T-section extruded longerons to give additional strength. At wing spar stations there are two exceptionally massive frames, which are built up box-members to carry wing loads. Along each fuselage wall, and up to a point some six inches below window baseline, there is a boxed duct for ventilation. Special box structures provide additional strength at window cut-outs. Although the cross section of the fuselage changes considerably throughout its length, the structure remains essentially similar. The rear luggage compartment wall forms the pressure bulkhead.

Passengers enter through an upward-opening door on the port side at rear of cabin, and this door is supported by an integral strut. Similar struts are used also in the doors to rear baggage compartment and to forward starboard door used for crew entry and for loading forward baggage compartment. In addition, there are two emergency exits above window level.

► **Center Section**—Center portion of the wing is built up around two plate-web spars with extruded L-section spar caps. Interspar ribs are of the diaphragm type, those in the central section being cut away for the installation of auxiliary fuel cells in the tunnel so formed.

Attachment of the center section to the fuselage is made through eight high-tensile steel-strap fittings, four, attached vertically outboard of fuselage, taking lift loads, while diagonally attached inboard fittings take side loads. Drag stresses are taken by heavy gage flanged angle members riveted to the inside of fuselage skin and to center section. The three inner ribs in the center section have fork and lug attachments to fuselage roof structure for transmission of longitudinal loads where fuselage is cut away to take the wing.

► **Outer-Wing**—Two interesting features are found here. Attachment is made to the center section virtually through the skin itself; and the fuel tanks at each root end are integral parts of the structure. There is no direct connection between the center section and the outer wing spars, though there are rack fittings for transmission of lift and torsion loads. Remaining stresses are transferred through joint plates with spanwise bolts and spools. Thus, the outer wing section is easily and quickly removed.

Outer wing spars are similar to those used in center section, the caps being progressively lightened, by machining, towards wing tips. Outboard of the tanks the interspar ribs are girder braced members, and the extruded stringers are fanned out from front spar as skin stresses are reduced towards wing tip. Skin thickness varies between 14 and 18 gage over the wing surface, depending on the stresses taken.

While the leading edge structure at the center section is of the unit type, with access doors hinging forward in the undersurface, that of the outer wing is designed for thermal anti-icing and has usual corrugated inner skin supported on pressed-sheet nose ribs. Hot air in the anti-icing system flows between corrugated and outer skins.

► **Fuel Tanks**—The wing structure with its heavy gage skin is said to lend itself naturally to the installation of integral tanks, in the comparatively thin wing section, offering a worthwhile saving of weight. Normal fuel load is 1,000 gal. in two tanks. These tanks are well outboard of the engine nacelles and are substantially free from distortion effects due to heavy landings.

Spar webs form the front and rear walls of these tanks, with a ventilated cavity between front spar and the insulating diaphragm behind the heated leading edge. Ribs in the wing tank section are plate webs with internal cut-outs and act as anti-surge baffles. Tanks are designed and constructed to be leak-proof, but, as an additional precaution, the inside surface is also covered with sealing membrane. Extensive load and vibration tests have been made to ensure permanent fuel-tightness even without this additional safeguard.

All sides of each tank are accessible and the interior of each can be reached through a manhole at its inner end. Fuel supply is taken from a large capacity sump, and provision is made both for pressure and gravity refuelling.

In addition to the integral tanks, arrangements are made for fuel cells, with a capacity totalling 600 gal., in the center section.

► **Tail Unit**—Structural features of the tail unit are similar to those of the wing. The cantilever tail plane is a two-spar structure with pressed sheet ribs and is attached by blade forgings to the fuselage. Featured are interchangeable outboard fins. Both the tailplane and the fins have thermal ducts arranged similarly to those of wing.

► **Control Surfaces**—With the exception of the split trailing-edge flaps, all movable surfaces are fabric covered.

• **The three rudders** are directly interconnected, permitting use of a single torsion spring-tab to lighten control movement. This tab is also used for trimming. Outer rudders are interchangeable, and have small horn balances carrying mass-balance weights.

• **Ailerons** are each in three portions with universal couplings. Both geared and trimming tabs are used.

• **There is a rigid** connection between the spars of the two elevators, which have adjustable geared tabs and are mass balanced.

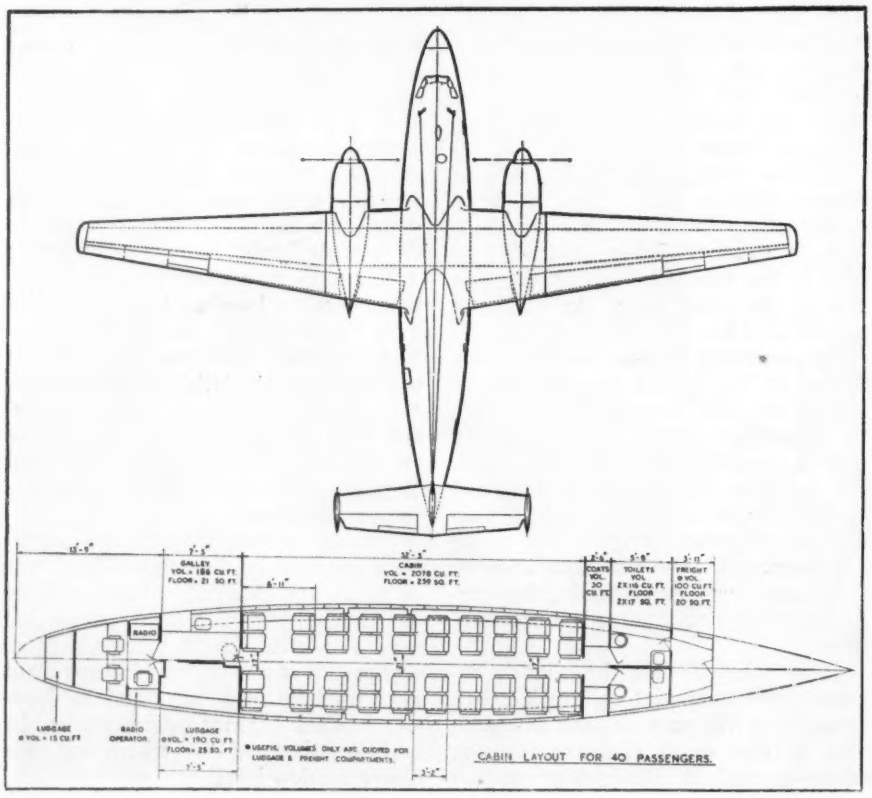
All the control surfaces other than the center rudder, have shrouded leading edges, and are sealed so that full pressure difference is available for aerodynamic balance.

• **Split trailing-edge flaps**, covering 25 percent of the wing chord, are mounted immediately inboard of ailerons. These are hydraulically operated through toggle-arms actuated by a laterally moving push-pull rod. They can be set at any angle up to 50 deg. from closed position.

► **Control System**—To minimize the effect of cable slack and to compensate for expansion difference in varying temperatures, a special control-run system was developed.

Rack and pinion gear units at each end of the elevator and rudder control systems transform a movement of 5 in. at the control column and rudder pedals to one of 25 in. in the main run of the cables. These cables, consequently, carry a much smaller load, and a lighter and more flexible cable can be used to reduce static friction and other losses at the pulleys. A similar gearing system is used in the aileron control run, with screwjacks replacing the gear boxes at the control surfaces.

The control system has been laid out so that direct-operating servo-motor type of electric automatic pilot may be installed without further modification.



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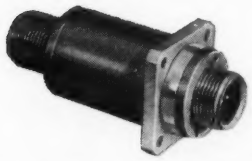

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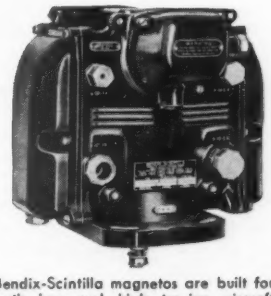

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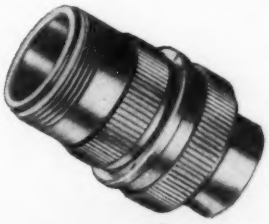

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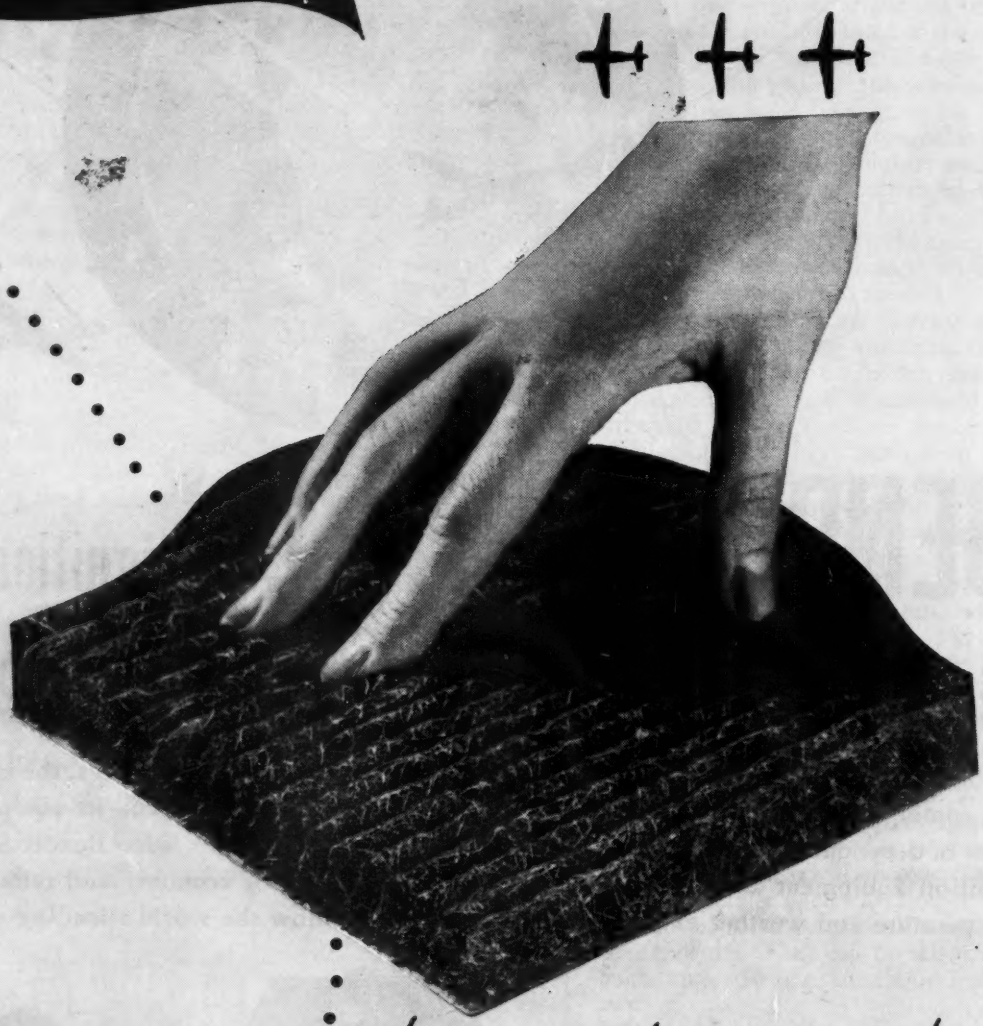

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► **Hydraulic System**—Within the limits set by the need for safe and practical operation in all conditions, the auxiliary equipment may be described as being all-electrically powered. The undercarriage, flaps, nose-wheel steering, and brakes are directly operated by hydraulic means, but power is provided by an hydraulic accumulator pressured by an electrically driven hydraulic pump.

This arrangement permits a minimum of hydraulic piping and accessories, considerably reducing weight and complication of the installation. Pump and its motor are in use only at infrequent intervals. The various services may be operated at all times, either by using the aircraft's own battery system or a ground supply. In event of main power or other electrical failure, the hydraulic accumulator maintains the pressure for one operation of all services—including brakes after landing.

Both hydraulic pump and accumulator are in the nose of the aircraft and are immediately accessible through the hinged nose-piece.

► **Landing Gear**—The tricycle undercarriage has been designed so that lowering is completed by gravity, assisted by the drag effect of air pressure—an action which is both positive and simple. The motion is damped, and lowering is completed within 5 sec., while retraction is completed in 7 sec.

Location of main undercarriage wheels is at mid-chord, and use of wide track and long wheelbase ensures ground stability. Use of pedal type brakes and a steerable nose-wheel permits the controls to remain locked at all times while the craft is on the ground, reducing the difficulty of taxying in strong winds.

Dual wheels are used, and because full load can be handled when any one of the tires has been deflated, this is considered a useful safety point.

► **Anti-Icing**—Hot air from two gasoline combustion heaters in the center section is fed through ducts along the leading edge from which it is regulated to flow chordwise, and evenly, in close initial contact with the lengths of the upper and lower leading edge surfaces and as far rearwards as the front spar, where it enters the wing structure and is emitted along the trailing edge. A third combustion heater in the rear fuselage supplies hot air to the tail surfaces.

Necessary air supply is ram-fed through leading edge intakes which (when not in use) are closed by flush-fitting, electrically operated flaps.

► **Pressurization**—Cabin conditions equivalent to a height of 8,000 ft. can be maintained at an outside pressure-altitude of 20,000 ft., with similar relative differential at intervening heights. Two supercharger units deliver filtered air through the heaters, coolers, and silencers to the cabin duct. Each of these blowers, alone, provides a sufficient volume of air to maintain correct cabin conditions when the engines are turning at cruising speed. In event of engine failure, increased revolutions of the good engine, necessary to maintain flight, increases the blower output beyond the minimum required. Relief valves limit the pressure differential to the designed 4 psi.—though the fuselage has been stressed to handle a load of twice this figure.

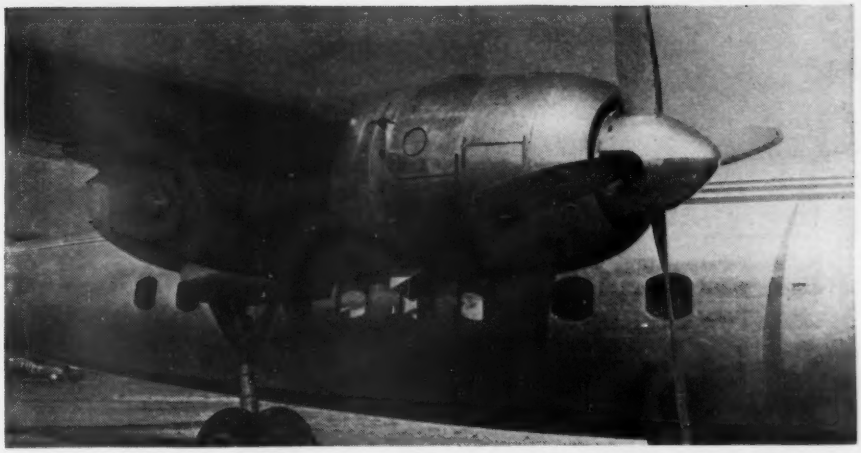


Photo shows excellent visibility provided by high wing design. Note that engine nacelle has only one protuberance extending into the slip stream. Cowl flaps and oil cooler shutters operate internally and are thermostatically controlled with a manual over-ride for emergency operation. Power-egg installation facilitates quick engine change.

Ambassador Basic Data

DIMENSIONS

Span	115 ft.
Length	80 ft. 3 in.
Height	18 ft. 10 in.
Wheelbase	25 ft. 6 in.
Track	27 ft. 6 in.
Wing area	1,200 sq. ft.
Mean chord	10 ft. 5 in.
Root chord	15 ft. 7 in.
Aspect ratio	11

SPEEDS

Max. cruising lean mixture at 10,000 ft.	282 mph.
Recommended economical cruise at 12,500 ft.	255 mph.
Minimum economical cruise at 10,000 ft.	195 mph.
Stalling speed—full load wheels and flaps down	86 mph.
Stalling speed—full load flaps up, ICAO takeoff	105 mph.

TAKEOFFS, CLIMBS, CEILINGS (Normal)

Distance to 50 ft.	3,900 ft.
Rate of climb (rich mix.)*	1,450 ft./min.
Rate of climb (lean mix.)*	1,010 ft./min.
Cruising ceiling	25,000 ft.
Absolute ceiling	27,500 ft.
Landing distance from 50 ft.	2,640 ft.

* at 5,000 ft.

TAKEOFFS, CLIMBS, CEILINGS (single engine)

Distance to 50 ft. (engine failure at safety speed)	5,040 ft.
Safety speed	126 mph.
Minimum speed for asymmetric rudder control	98 mph.
Rate of climb (gear up, prop windmilling)	385 ft./min.
Rate of climb (gear up, prop feathered)	525 ft./min.
Rate of climb (gear down, prop windmilling)	190 ft./min.
Rate of climb (rich mix. at 5,000 ft., enroute climb)	330 ft./min.
Cruising ceiling	11,500 ft.
Wing Loading	39.2 lb. sq. ft.
Power loading—takeoff	8.75 lb. bhp.

Cabin air is induced through a vent in the undersurface of each side of center section by motor driven fans which can feed it through the heaters. Fans and heaters are duplicated and can be operated either in the air or on the ground. A properly conditioned atmosphere can therefore be maintained throughout the interior, during ground stops, in varying climatic conditions.

► **Control Cabin**—In its standard form, the cabin is laid out to accommodate a flying crew of three (two pilots and radio operator). The central pedestal is conveniently arranged. Each pilot has his own blind-flying panel, on which the master instrument is a D. R. compass.

All engine and auxiliary instruments are centrally placed so they may be seen from either seat, and dual-pointed dials are used whenever possible to reduce overall number of instruments. Torquemeters are included to enable the crew to maintain optimum engine-running conditions, and to give early warning of any possible failure.

All information lights—which include a "safe-to-takeoff" indicator are laid out together on the captain's side of the dashboard, while non-essential switches and controls are on a panel to right of the captain's seat. Both ultra-violet and red lighting systems are provided.

A simple propeller-braking system has been developed. In this the throttles, when in the braking sector of the quadrant, are moved in a natural sense for swing correction. Since the reversing switches are throttle operated, the pilot's hands do not have to be removed from the throttles at the moment of propeller braking. This promotes added safety in operation.

Safer landings . . . . BARTOW beam-controlled

Main ILS runway at Wold-Chamberlain Field, Minneapolis-St. Paul, showing new Bartow high intensity runway lighting as pilot sees it just before landing. Range lights in foreground. Runway has the latest type Bartow beam-controlled units, as shown at left.

● Maximum safety, minimum passover, less stacking up and shorter landing time, fewer cancellations and delays—these are some advantages of Bartow high intensity approach and runway lighting systems.

Airline landings are made regularly, safely, under low visibility conditions, without reducing present proved minimum safety standards. When, for example, reported ground visibility is given as ⅜ mile, Bartow lighting increases cockpit visibility of the runway to one mile.

This lighting was first developed over 10 years ago by Bartow Beacons, Inc., and with the cooperation of L-M lighting engineers, has been steadily improved. During the war it was installed by the army and navy at hundreds of locations throughout the world. Pilots who flew in the Aleutians, Newfoundland, and other tough-flying areas can tell you what Bartow lighting did to bring them in to safe landings.

Principles of Bartow Beam Control . . . How it Works

Lights are spaced at 200-foot intervals along the runway. As the pilot approaches, he sees two rows of lights, delineating the runway and giving him the necessary perspective Under limited visibility, the first pair of Bartow units points two beams of light at the place where the pilot will be when he *must* see, as he goes off instruments and onto visual contact.

As he moves forward another 200 feet, he comes into the meeting point of the second pair of beams. He still sees the first pair; but even though he is closer to them, he is just out of their point of focus, and they appear no brighter than the second and successive pairs. All appear of equal brightness, because the light beams reach him at different angles. There is no glare to obscure the more distant lights.

"Coned-in," and stepped up

When dust, fog, rain or, worst of all, daylight snow lower the visibility, light intensity is stepped up, and beams are "coned-in" or toed-in so that beams from each side of the runway meet at the greatest distance conditions permit. Each unit has up to 180,000 beam candlepower to push the light through murky weather. In clear weather intensity can be cut as low as one percent.

Only two simple controls

Intensity and focus are controlled from the tower. One five-point switch changes taps on the transformer to change the voltage. One toggle switch moves a pointer back and forth to the required "Visibility" figure on a day or night chart—and synchronous motors in each unit aim the fingers of light at precisely the right point. It's as simple as that!

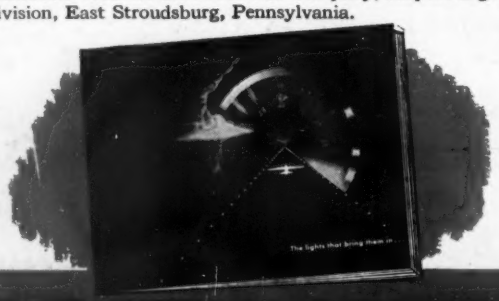
The L-M Bartow lighting is the only completely controlled system, and has the highest light intensity of any runway system developed to date. Usually it is the most economical to install. Units give 360-degree visibility but concentrate the light without glare where it is most needed—toward the pilot.

Fully approved by CAA

The Bartow system is the first high intensity lighting given *full* CAA approval—the only one *flight-tested and fully approved* to date. This lighting, combined with approved instrument systems, gives maximum safety for all-weather airport operation.

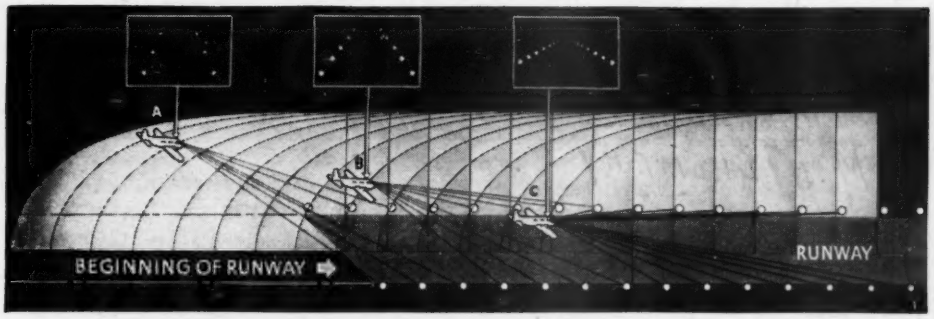
Write for this Brochure, "The Lights that Bring Them In"

A scientific explanation of the principles involved in approach and runway lighting. Illustrated with many charts similar to those on the opposite page. If you are concerned with runway lighting, send for a copy. Please state your position or business connection. Address Line Material Company, Airport Lighting Division, East Stroudsburg, Pennsylvania.



fewer delays . . . with high intensity APPROACH AND RUNWAY lighting

Charts show principles of Bartow Beam-Control

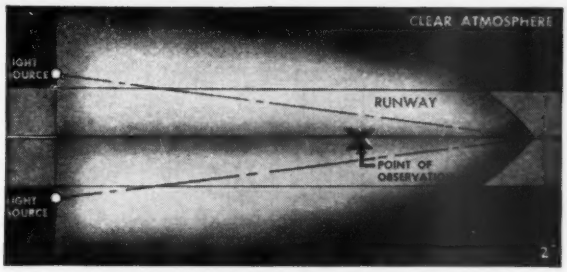


1.

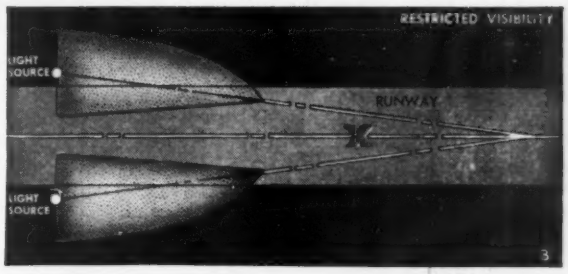
To land, the pilot must see two rows of lights to establish necessary perspective. Chart shows approach on a Bartow equipped runway. At "A" the pilot has entered the effective area of three pairs of lights. At "B" and "C" he sees progressively more lights. Light intensity of the nearest unit is the same as of the farthest.

This system permits use of extremely high candlepower at low angles, giving maximum cockpit visibility—where it is needed most—without glare or halo.

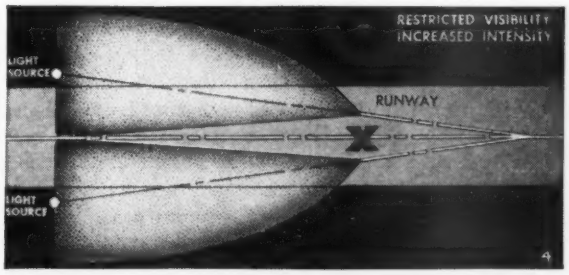
(Charts are from the Brochure, "The Lights that Bring Them In," described on opposite page. Angles are exaggerated.)



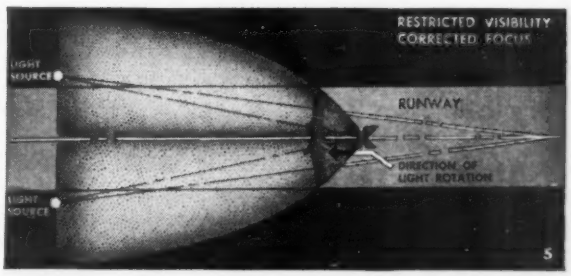
2. Effective envelope of light, in clear atmosphere, of one pair of lights—one on each side of the runway. Each light is of equal brightness along the center zone of the runway. (To simplify this explanation, only *one pair* of lights is shown, although the pilot always sees *two rows* of lights, one on each side of the runway.)



3. Restricted visibility: the envelope of light shrinks in fog, dust, etc. Penetration of the high candlepower beam is reduced more than the low candlepower beam, and the effective areas fall away from the center line of the runway. This lighting would be ineffective—the pilot could not see the lights even if he were in the right position!



4. Increased intensity alone does not restore the path of equal brightness shown in chart No. 2 above. Increasing the candlepower increases the penetration of the low candlepower beam, but the high intensity beams are still not reaching the pilot, leaving a dark path in the center from which the lights are not visible.



5. Corrected Beam Direction, with lights "coned-in" toward the center line of the runway, eliminates the dark area, restoring the path of equal brightness. Thus the *combination* of brightness control and beam direction control gives maximum penetration, without glare or halo, under any given atmospheric condition.

LM

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Unique Rotor Affords New Safety

Design aims to minimize fatigue stresses and overcome roughness.

By GILES N. MONTGOMERY
(Engineering Staff, Doman-Frasier)

Although the helicopter is finding wider commercial utility every day, it is evident that problems still besetting this configuration have prevented its assuming its ultimate role. For example, the basic question of how many and what types of rotors and blades is still one of the primary subjects of discussion among engineers and designers.

Vying for attention in this area is the Doman rotor system. Doman-Frasier Helicopters, Inc. have not concerned themselves with the controversy of how many rotors the helicopter shall support or in which of the many possible ways they shall be arranged, but rather with the basic concept of the rotor itself. Emerging from this research is a rotor which is new in approach and solution.

▶ **Rotor System Characteristics**—During the 26 hr. already logged with the Doman rotor system, these observations have been made:

• No system parts have needed replacement because of wear or failure. Parts have been changed, however, because they did not perform in accordance with design calculations—something which may be expected in test research.

• The helicopter (Sikorsky R-6) on which the Doman rotor has been installed has been repeatedly flown at sustained speeds in excess of 100 mph. carrying 500 lb. of disposable load. (The world's speed record for 'copters is 114 mph.—Sikorsky R-5.)

• Stress measurements of the rotor blade shanks have been made in all regimes of flight. A Goodman diagram made for these findings indicates that in the matter of fatigue, the rotor blade life will be infinite.

• At 100 mph. forward speed, the vibratory stress in the rotor blades is less than one-tenth their endurance limit.

• The aircraft is without rotor-induced vibration throughout the flight range and in any normal 'copter maneuver.

• There is no pilot control stick shake at any speed, and only finger tip pressure is required to guide the craft.

• The craft has been flown with center of gravity changes of as much as 15 in. with no changes encountered in the stress on the blades or variations noted in the handling characteristics of the 'copter.

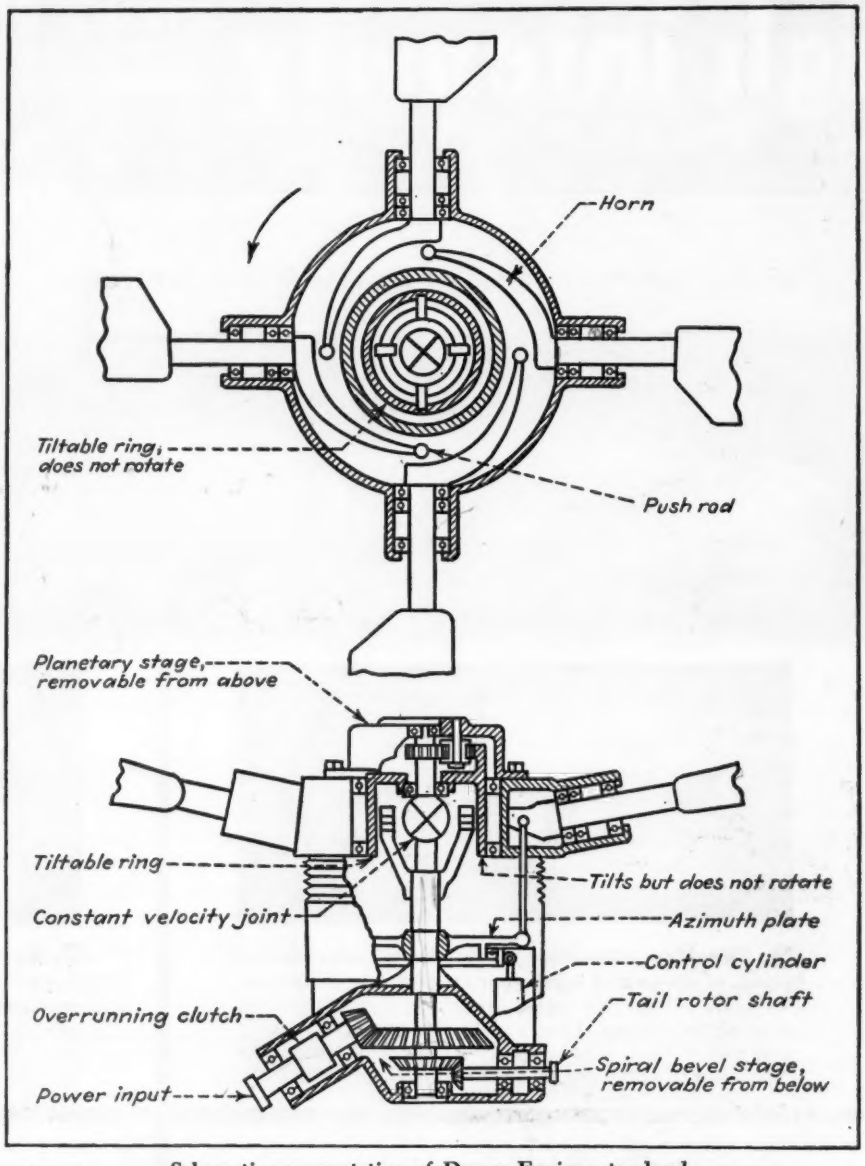
• The autorotative characteristics are excellent.

• There is complete freedom from ground resonance.

• The rotor mechanism is simple insofar as number of parts required is concerned. All non-standard parts may be safely made from castings or turnings. No forgings are required.

• The Doman rotor-equipped 'copter cannot be flown for long periods hands off, and will not lift a greater load than any other well designed 'copter.

• Capability of achieving a higher speed with the Doman rotor than with other designs of similar disk loading, power, and tip speed is due solely to the absence of vibration and to low blade stresses at high speed.



Schematic representation of Doman-Frasier rotor head.

▶ **Rotor Problems**—General factors affecting rotor design and their relation to the Doman system are given in the following breakdown:

• **Control**—With one exception, all single lifting rotor 'copters achieve directional control by cyclic pitch change of the blades. Mechanism is provided, which in effect will cause each blade, as it passes one side of the craft, to reduce its pitch, and while it passes the other side to increase its pitch. Each blade will thereby have high lift on one side and low on the other. However, the blades are in rotating motion, and so are subject to gyroscopic phenomena. For this reason, if the point at which the blades experience their highest lift

be considered as a force applied to the rotor at one point, the entire whirling mechanism will respond in gyroscope fashion by exhibiting a pronounced tendency to tilt at 90 deg. to the applied force.

By making available to pilot the ability to select at what point about the craft the blades shall pass through the area of high and low lift, the lift vector of the rotor may be inclined in any direction relative to the fuselage C. G. This system provides an effective means for flight in any horizontal direction and is the system used on the Doman rotor.

Devices worked out to accomplish this cyclic pitch change are many, but they all work down to becoming a flat plate cam whose magnitude and direction of inclination may be controlled by pilot. The individual blade is equipped with actuating mechanism so that as a push rod from the blade rises and falls in its circular path around the inclined cam the blade will increase and decrease its pitch. This cam is known as the azimuth plate or swashplate.

Another conception of achieving directional control is one in which the C.G. of the entire aircraft may be shifted relative to the rotor head. One aircraft has reportedly been flown by this method.

• **Attachment of Blades** – Although cyclic pitch change will effectively shift the center of lift relative to the hub and so tilt the craft, if the blades are rigidly attached many difficulties are encountered. The pendular action of the fuselage will in itself place forces into the rotor which will unfortunately respond by tilting at 90 deg. to the force. Conceivably, pilot could, by training, learn which way to move his control stick to correct for this, but it would be anything but natural.

A second consideration is the stress reverses that would occur in the blades every revolution when cyclic pitch is applied to handle a C.G. change in the aircraft. Under such condition the blades would be called upon to hold the craft in a given attitude by sheer bending which would ensue in a pulsing movement every revolution.

Some method must be employed so that the rotor head will not be affected by these dangerous conditions.

Most common path away from this problem is to provide each blade with a horizontal hinge at its root. The blades are then free to rise and fall at will (flap). Centrifugal force acting on the rotating blade mass will tend to keep the blade out horizontal. Aerodynamic lift will try to raise the blade. The blades arrive at a coned position where these two forces balance. The shank bending moments in the blades due to supporting the craft are removed because the blades are now in pure tension in the vertical plane. The aircraft is supported in the air by the vertical component of the tension force on the coned blades.

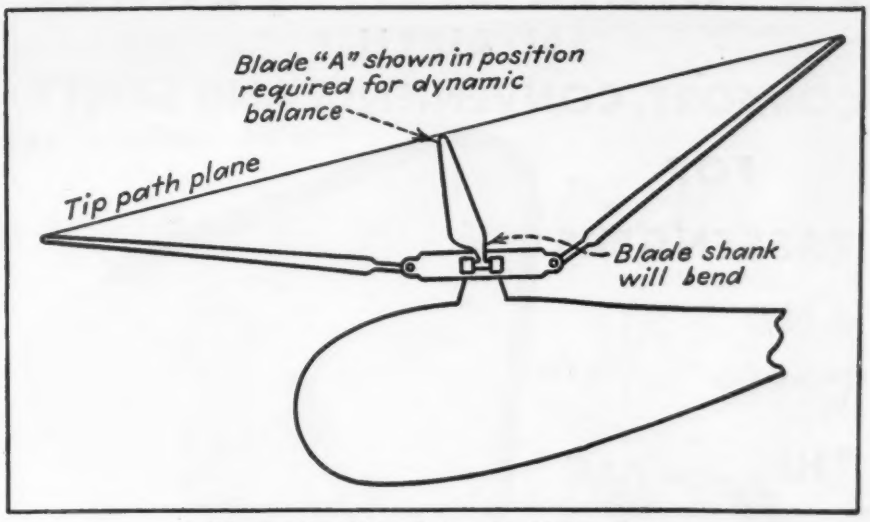


Diagram of coriolus effect on four-bladed rotor.

This is a very neat and simple solution, but it leads to a series of new and staggering problems, which will be weighed. It is not the method used in the Doman rotor system.

Another method of divorcing the rotor head from the aircraft is to keep the blades rigidly attached to a hub, and then attaching this hub to the craft with a universal joint. This is the scheme used on the Doman rotor. This system is also not without ensuing problems, but they are fewer, and new solutions have been found which are eminently satisfactory.

• **Flapping Hinge Bearing**—In a 2,500-lb. 'copter, the centrifugal force developed by each rotor blade will work out to be in the neighborhood of 10,000 lb. or more. In those configurations requiring individually flapping blades, a bearing must be used on each blade, which can carry this heavy load. Such bearings are available. However, in action, the bearing oscillates through about only 3 deg. The result is that a very small area of the bearing is actually used and service life is discouragingly short. Furthermore, these bearings must be free and retain identical friction characteristics. The problem of this bearing cannot be minimized; a completely satisfactory solution has not been found in a hinged type rotor.

The problem does not arise in the Domen rotor because the gimbal mounting of the rotor hub makes the flapping hinge unnecessary.

• **Coriolis Effect**—With a rotor using a flapping hinge, the 'copter in forward flight will have the blades rising to a high point over the back of the craft. Were it a four bladed helicopter the appearance would be as shown in the accompanying sketch, at the instant one blade is closest to the observer. The fourth blade is not seen because it lies directly behind the blade designated *A*.

It is to be noted that the axes of the flapping hinges remain horizontal. This being the case, the only way blade **A** can manage to get into the position shown (and this is the position it must be in to be in dynamic balance) is for the blade shank to bend as indicated in the diagram. The forces that tend to bring blade **A** to this bent position are very large since they arise from the great momentum of the blade which tends to keep it moving at constant angular velocity relative to the tip path plane.

This condition is true on a flapping hinged or see-saw type rotor of any number of blades, but is most easily shown on a four bladed system. This periodic bending of the blade shanks is so destructive that the rotor blades would soon come adrift if remedial measures were not taken. The forces involved are so great that they cannot be safely carried by simply strengthening the blade.

It would seem that a 'copter with a universally mounted hub such as embodied the Doman rotor might be without the coriolis problem because the rotor hub will incline and remain parallel to the tip path plane, so that bending of the blade shanks is not necessary. Actually, the coriolis condition also exists in the form of a universal joint problem. The greater the angle through which a universal joint is required to operate, the more uneven will be the motion of the driven member. On a 'copter with a gimbal mounted hub, periodic acceleration and deceleration of the blades from this universal joint effect will cause stresses of intensity similar to those encountered in a flapping hinge type, as a result of coriolis.

To overcome this condition, some users of the gimbal mounted hub em-

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FLOW DATA (At 20,000 ft.)			
Outlet Type	Min. Flow L.P.M.	Approx. Discharge Time, Min.	
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A	2	100	60
B	3	67	40
C	7	29	17
D	8	25	15

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ploy a rotor mast which is very flexible torsionally. Periodic rotor accelerations on the head are thus absorbed by torque wind-up of the rotor shaft. This scheme seems to have the objectionable feature of taking the vibratory stresses from one point of the aircraft only to apply them to some other point.

The solution employed on the Doman rotor is unique and completely does away with the vibratory stresses. A constant velocity universal joint is employed as the driving attachment of the rotor mast to the rotor hub. The entire rotor head is free to tilt to handle any condition of forward speed or C.G. movement of the fuselage and yet remain in perfect dynamic balance. The use of a constant velocity joint at this point is considered to be a major contribution to the helicopter art. Its effect in reducing blade stressing has been most gratifying.

Because a constant velocity joint cannot be designed to take thrust, a double universal joint arrangement is used. It is shown in the accompanying schematic sketch of the rotor mechanism, that the gimbal ring type universal joint carries the thrust load. The torque to rotate the head is supplied through the constant velocity joint. Both joints have a common tilting center.

(Further discussion of rotor design problems will be presented in the next issue.)

Information Tips

Data on Radiography

Designers, engineers, production men, and inspectors concerned with aviation materials will be interested in new 16-page illustrated catalogue, issued by **Eastman Kodak Co., X-Ray Div.,** Rochester 4, N. Y., listing materials and accessories for industrial radiography. Included is information on films, exposure holders, intensifying screens, chemical preparations for processing, darkroom accessories and viewers. Chart indicates relative speed and contrast of different types of x-ray films for computing exposure.

Aviation Accessories

Scott Aviation Corp., Lancaster, N. Y., announces new folder listing entire line of aviation accessories for 1948. Included are details on tail wheels, engine instruments, and fuel gages.

Antenna for Static Reduction

Eight page booklet on reduction of precipitation static in aircraft radios is offered by **Dayton Aircraft Products Inc.,** 342 Xenia, Dayton, Ohio. Publication goes into considerable detail on causes for precipitation static, describes methods developed by U. S. Air Forces for its reduction. Antenna system described is stated to provide greater assurance against breakage under icing conditions, and, if desired, reproduction of U.S.A.F. technical order covering installation of equipment on army planes will be furnished.

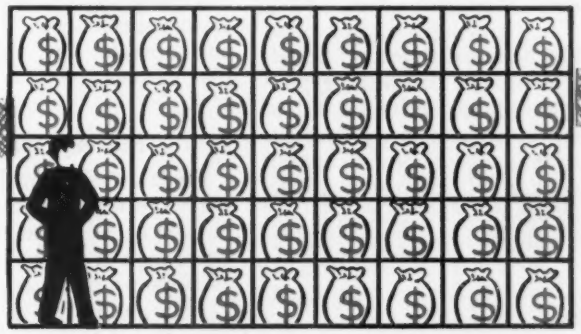
Welding Equipment, Hints

For production personnel, **Tweco Products Co.,** Wichita 1, Kan., issues new 12-page catalog describing line of welding electrode holders, ground clamps, cable connections and splicers, machine terminals, lugs, and carbon holders. Bulletin CC-47 "Causes and Cures for Hot Running Welding Cables and Connections" is also issued to offer helpful hints to every day problems.

question for airline executives...

What Inventories Must You Carry?

Why should it be necessary to tie up in large inventories the capital that otherwise could be used in productive operations?



Large inventories can tie up airline capital

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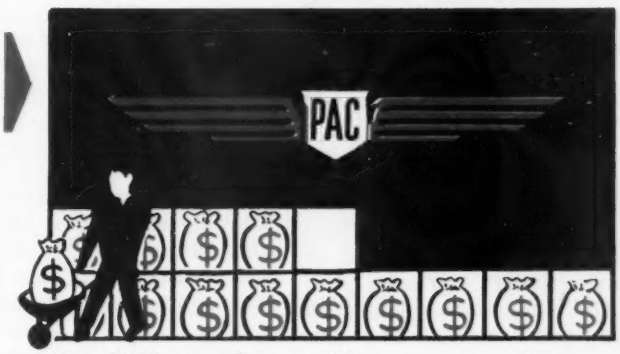

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Adaptable for surveys of aircraft interiors and test cells, new portable carbon monoxide tester is announced by **Mine Safety Appliance Co.**, Pittsburgh 8, Pa. Utilizing indicator tubes developed by National Bureau of Standards, tester is capable of revealing presence of carbon monoxide from 0.001 to 0.10 percent by volume in air. Nucleus of instrument is detector tube containing yellow silica gel, impregnated with complex silico-molybdate compound and catalyzed via palladium sulfate. Sealed ends of tube are broken in tube-breaker and tube inserted in instrument tube-holder. Sample of air is aspirated through tube by squeezing bulb, and if sample contains CO, yellow indicating chemical turns varying shades of green, directly proportional to concentration. Degree of gel discoloration is then compared with integral revolving color scale for quick reading.

Socket Set Improved

For aircraft factory and repair base usage, redesigned $\frac{3}{8}$-in. drive line of sockets and handles conforming to shape of hand is announced by **Snap-on Tools Corp.**, Kenosha, Wis. Known as Snap-on Ferret Set, four sockets have been added to give size coverage between $\frac{1}{4}$ and $\frac{7}{8}$ in. Units have four indentations on inside of drive hole to make easy engagement with ball in handle of driver. Improved size markings are for easier selection.

Radio Frequency Generator

For high production induction heating jobs such as hardening gears or progressive and selective shaft hardening, 50-kw., 450-kc. RF generator and matching two-position work table is offered by **Westinghouse Industrial Electronics Div.**, plant 4, Baltimore 3, Md. Generator is assembled to include all control equipment, high voltage rectifiers, protective devices, oscillator tubes, RF tank, and coupling circuits in complete unit. Outstanding features are lightweight aluminum cabinet, complete RF shielding to insure compliance with FCC radiation requirements, stepless power output control by grid control rectifier, filtered air for easier maintenance, circuits fully protected from overloads, and large 6-in. meters providing easy reading. Work table has stainless steel sink and complete fittings for two station operation. Multiple mounting bosses are provided on sink for easy installation of work-handling equipment. Table has dual fittings for quench and cooling water and two sets of heavy duty RF output terminals. Weighing approximately 7,000 lb., generator measures 144 × 60 × 84 in. high and operates on 230/460v., 3-phase, 60c. current.

Makes Battery Water

Of interest to small airport operators is new water demineralizer designed to prepare battery water from ordinary raw water high in mineral content. Stated as functioning to make tap water chemically equivalent to distilled water, flow from faucet enters at bottom and works up through series of four beds of synthetic plastic-like materials known as ion exchange resins. In first bed, water is acidified; in next and subsequent beds, neutralized and absorbed. Substances removed are claimed to include sodium, potassium, calcium, magnesium, iron, copper, and lead; salts removed: sulphates, carbonates, and chlorides. Made by **Penfield Mfg. Co.**, Meriden, Conn., unit consists of wall bracket, renewable resin cartridge, and electrical resistance indicator to show when new cartridge is needed. Cost of demineralized water is represented as few cents per hundred gallons.

Aircraft Voltage Regulator

Intended to provide controlled voltage for electrically heated aircraft windshields, voltage regulator is offered by **Westinghouse Electrical Corp., Aviation Div.**, Lima, Ohio, to handle 11 kva., 3-phase, 208/120v., 4,000-8,000-rpm. alternator. Panel is arranged with plug connector for ease of installation on shock mount in craft, and all maintenance, testing, and adjustment can be performed at service bench. Unit weighs slightly over $6\frac{1}{2}$ lb.

Information Tips

Fabrics, Finishes, Plastics

Utilization of Nylon, finishes, and plastics in various phases of aviation industry are outlined in articles in duPont Magazine, Vol. 41 No. 5, published by **E. I. duPont deNemours & Co.**, Wilmington, Del. "Nylon Takes to Air" points out important characteristics of fabric as air safety device. Primers, enamels, lacquers, and other coatings are explained in "Flying Finishes." And duPont "Airborne Plastics" tells of mounting importance of these materials in aviation.

Electrical Developments

Of general and specific interest to engineers in the aviation industry is comprehensive annual review titled "Electrical and Allied Developments of 1947," scheduled for publication this month by **General Electric Co.**, Schenectady, N. Y. Included are data on phases of transportation, research, testing and measuring, electronics, power, industrial equipment, illumination, air conditioning, appliances, and other subjects.

Cutting Fluid Data

"Cutting Fluids for Better Machining," is 72-page pocket-size catalogue of metalworking information offered by **D. A. Stuart Oil Co.**, 2727 South Troy St., Chicago 23, Ill. Revised to keep pace with latest metal cutting developments, booklet contains much data on application of company's oils for cutting, grinding, drawing, quenching, and tempering, also other phases of metalworking and industrial lubrication. Included are sections on metal cutting mechanisms, selection of cutting fluids, rules for prolonging tool life, handy tables of standard steel specifications, independent research committee data, and marking system chart for grinding wheels.

For Balance-Weight Applications

"Hevimet"—alloy of tungsten, copper, and nickel—is now being marketed by **General Electric Co., Metallurgy Div.**, Pittsfield, Mass. Originally developed as high density product for use on gamma ray screen, this sintered material is represented as adaptable to construction of balance weights for eliminating vibration in crankshafts, propellers, and other rotating parts. Possessing density 50 percent greater than lead, alloy is stated to have great tensile strength with good machinability, high resistance to atmospheric salt water corrosion, and to be easily plated with cadmium, chromium, or nickel. Silver soldering or brazing may be applied by standard methods. Forms are variety of nonporous sheets and blocks, and complex shapes may be built up from simple pressing by special process of hydrogen welding. Average product has density from 16.8 to 17 grams per cu. cm., tensile strength of 85,000 to 118,000 psi., and Rockwell hardness of 30 to 40 C scale.

Radio Compasses Available

Immediate delivery through stepped-up production facilities of ARC-10 automatic radio compass is announced by **Lear, Inc.**, 110 Ionia Ave. N. W., Grand Rapids 2, Mich. Unit can be supplied with special kit, without extra charge for installation in light aircraft, including special dust cover and dress panel so as to fit tuner unit into glove compartments of nearly all lightplanes. Special mounting brackets are also supplied.

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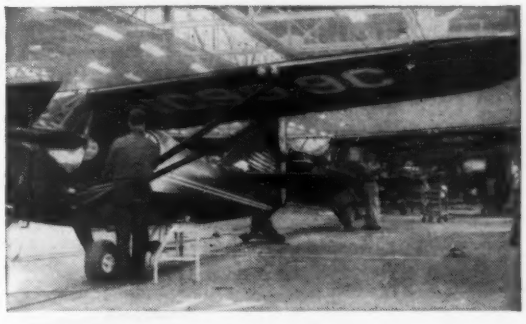

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Four Point Program Offered To Boost U. S. Civil Aviation

President's Air Policy Commission urges that steps be taken to bolster the airport program, fixed base operations and personal flying.

By ALEXANDER McSURELY

Four major recommendations of the President's Air Policy Commission Report relating to personal planes and civil airport operations offer prospect of major benefit to these phases of U. S. aviation if action implementing the recommendations is forthcoming from government.

The recommendations:

• **Military services** should weigh carefully savings possible through contract overhaul of military aircraft by civilian shops, and longterm advantages of building up civilian staffs trained in such work for use in an emergency.

• **Personal aircraft manufacturers** should take primary responsibility for compliance with aircraft design standards, promulgated by the federal government. Present CAA testing of new design personal planes should be conducted and "sworn to" by the manufacturers after they have been certificated by the Department of Commerce, as competent responsible producers.

• **Advisory panel** of representatives of state and municipal aviation groups should be named to work with the Air Coordinating Committee, giving local aviation interests a voice in national air policy issues, and a means of working more closely with federal departments and agencies.

• **Congress should appropriate** each year the full amount permissible under the Federal Airport Act (maximum $100,000,000 a year) for aid in building new airports and improving old ones.

Disappointment is being expressed within the industry about scanty recommendations for federal sponsorship of research to develop improved personal planes.

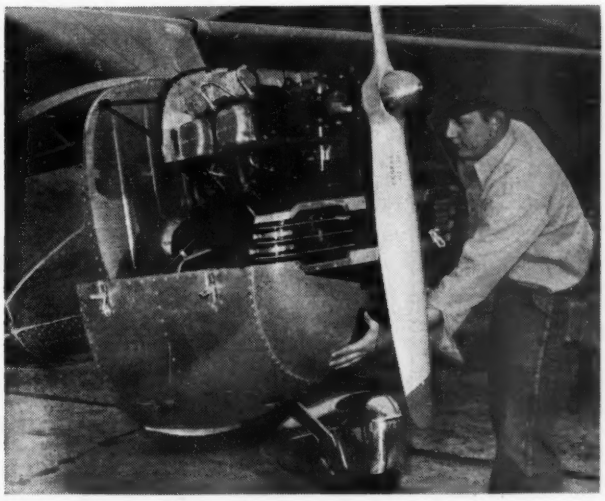
The report slides neatly around this somewhat controversial issue, by a mild statement that "another way in which government may properly encourage the development of aircraft suitable for private use (in addition to airport development) is by the NACA continuing some research directly applicable to small aircraft."

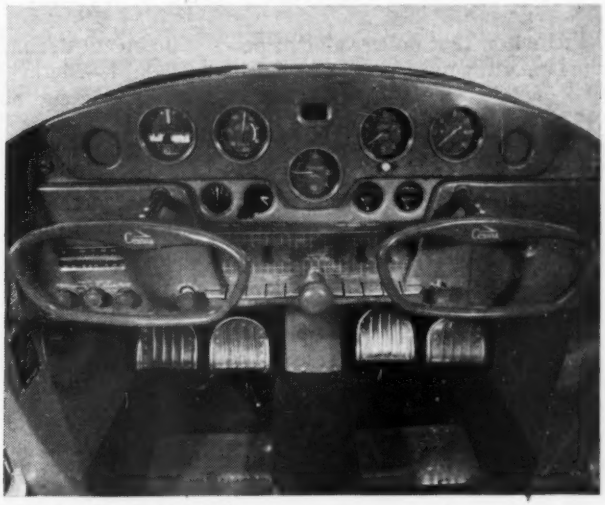
The report suggests further research on boundary layer control "would appear to be useful" and calls for studies exploring unconventional aircraft configurations such as "combining the principles of the helicopter and fixed wing airplane." NACA effort in these areas should be limited strictly to basic research, and not applied to development of any commercial article, the Commission recommends.

▶ **Cold Comfort**—The report likewise gives cold comfort to personal plane manufacturers looking toward military contracts, stating: "The military services cannot offer much in the way of direct financial assistance to the individual experimenter who may have a new idea for the development of a new type of personal aircraft." It does suggest "loans" of surplus or obsolete equipment (engines, instruments, propellers, etc.) "whenever occasion offers" with proviso that the services be given first information on any new developments which may result.

Commission indicates that the armed services expect value of personal aviation in future national emergencies will be materially less than it was in World War II.

"According to evidence submitted to the Commission, civilian instructors are unlikely to be required for any emergency within the next 15 years because of the availability of World War II pilots. This 15 year availability of World War II pilots for instructor, patrol, and transport duties, ensures





1948 CESSNA ENGINE AND PANEL

First photo of the new 90 hp. Continental engine installed as standard equipment in the two-place 1948 Cessna Model 140 shows quick accessibility of the C-90 installation. Improved instrument panel of the 1948 Model 140 has less glare than before. Throttle is moved up, making more knee room, while new type labels designate controls more clearly. Current price of Model 140 is unchanged from 1947 model at $3,345 flyaway Wichita, despite the increase in horsepower from 85 in last year's model. The two-place Model 120 continues with 85 hp. engine at an unchanged price of $2,845 flyaway Wichita.

personnel for these three important emergency functions which were largely performed by private pilots in the early years of World War II."

▶ **Pilot Problem**—This statement completely ignores the fact that many World War II pilots who would be readily available for any of these "three important emergency functions" within the next fifteen years would be World War II pilots who are continuing in civilian aviation. Unless civil aviation enjoys a reasonable health and provides opportunity for these men and for other World War II pilots to fly either for business or for pleasure, the pilot reservoir may well be much less valuable in emergency than is indicated.

The report gives credit to personal aviation for its value in World War II pointing out the usefulness of pilots and mechanics drawn from personal aviation; the use of civil airports and ground facilities; the value of the civilian pilot training program; the worth of converted lightplane types as liaison and light transport types; and the contribution of private flyers as members of CAP.

▶ **Taxpayers Contribution**—The Commission points out past "generous contributions" by the taxpayer to personal aviation, including government-sponsored CPTP, war production contracts to personal plane manufacturers, airport improvements during the war, and the VA flight instruction program under the GI bill of rights.

Pointing out that hundreds of thousands of military and civil pilots now "compose the largest ready made market for personal planes and airport facilities that has ever existed" the report says that this group will determine the near future of personal aviation, and that if they fail to continue flying, their neglect should be "an unmistakable sign to airplane designers that a new airplane is needed which will provide more utility at a lower operating cost."

The Commission states that a healthy personal plane industry "is of value to the Nation" and "should be encouraged, by continuation of funds for airports, for navigation and landing facilities and for basic improvements in personal plane design." "We believe that the appropriations to personal aviation for these purposes plus the very substantial financial assistance provided for veterans' flight training, is sufficient," the report concludes.

Port Authority Cites Fields In Annual Statement

Assurance that New York's International Airport will open at Idlewild next July came from Howard S. Cullman, chairman of the Port of New York Authority, in his annual report to the New York board of commissioners. Cullman said that two huge all-purpose hangars now under construction will be ready early in 1949 to augment the two hangars now at the airport and provide necessary base facilities.

Reason for Port Authority abandonment of negotiations with the Navy for civil aircraft use of Floyd Bennett field also was outlined by Cullman in the report.

"The improvements demanded by the Navy as its price for relinquishing the field steadily increased in quantity, quality, and estimated cost, ranging from $367,000 in the fall of 1946 . . . to $1,250,000 at the conclusion of their negotiations with the Port Authority," the report said. "The Navy insisted on a 'gold plated' improvement program as its price for relinquishing the airport and regretfully we were forced to abandon our efforts to use Floyd Bennett to alleviate the growing congestion on the ground and in the air at LaGuardia."

The imminent Army release of properties it holds under wartime lease from the City of Newark (N. J.) will put into operation a 50 year lease agreement between the City of Newark and the New York Port Authority covering Newark Airport.

Meanwhile reports of Port Authority interest in Teterboro Air Terminal, important air cargo gateway to New York, hint at the possibility of a move to integrate the field into the LaGuardia-Newark-Idlewild chain. The matter has not yet reached the negotiation stage between the Authority and Teterboro management.

Piper to Close Ponca City Branch

Closing of the Piper Aircraft Corp. branch assembly plant at Ponca City, Okla., is expected soon after Feb. 1, according to word received by the Ponca City Chamber of Commerce. W. T. Piper, Sr., president, indicated that he expected the Piper board of directors to vote to close the plant and that there was little hope of its reopening due to the present status of the small plane market.

The Ponca City plant is now employing approximately 80 persons, assembling planes from parts made at the main Lock Haven, Pa., Piper plant. The Lock Haven plant will still continue in operation.

At one time last year, the Ponca City plant was employing more than 300 persons and was turning out from 45 to 50 planes a day. Piper officials estimated they had paid out from $500,000 to $600,000 in salaries, and approximately $150,000 for plant improvements at the assembly plant which is located in Ponca City.

Whearty Is Newly Appointed Kansas Aviation Director

Riley R. Whearty, Topeka, wartime Air Force lieutenant colonel, has been appointed aviation director of the Kansas Industrial Development Commission, succeeding S. F. Robertson, Hutchinson. The aviation director's post was established by the Kansas legislature last year.

Personal Plane Forecast

Prediction that dollar value of personal aircraft production and sales in 1948 will probably equal that in 1947 although only one half as many airplanes will be sold was made to AVIATION WEEK by William A. Blees, Consolidated Vultee Aircraft Corp. vice president, in charge of sales.

Lightplane manufacturers probably will gross between $38,000,000 and $40,000,000 with dealers showing gross return on total estimated sale for 8,000 airplanes of $50,000,000, the Convair sales chief forecasts, basing his prediction on findings of his recent national sales promotion tour for Convair's Stinson division.

He believes final recapitulation of 1947 lightplane business will show the production and sale of 15,800 units.

Two things probably will influence, according to his estimates, a 50 percent decline in unit volume in 1948: I.—Market saturation by 1947 production and heavy losses incurred by a high majority of all lightplane manufacturers; and, II.—The trend away from production of high volume manufacture of two-place small aircraft and toward production of the four passenger airplane for personal use.

Blees said that in 1947 the only two airplane manufacturers (including makers of big planes as well as of personal aircraft) to make a profit were Convair's Stinson division and Grumman.

He would not disclose Stinson's net profit for 1947, but did say that during the fiscal year ending Dec. 1, Stinson division produced 2,714 of its four passenger "Voyager" personal planes for $12,000,000 factory gross return and $16,000,000 gross return to dealers.

$3,000,000 Asked

Wisconsin State Aeronautics Commission will ask the 1949 state legislature for $3,000,000 to match federal funds in aids to local airports, Thomas K. Jordan, executive secretary, announced at a recent meeting with a committee of the legislative council. The commission also may ask the legislature for a deficiency appropriation for Jan. 1 to June 30, 1949, for financing vital projects which could not be postponed.

The commission also will ask that the director's salary be increased from $5,000 to $7,500 a year, and that existing laws governing aeronautics be clarified to conform with federal laws.

Floatplane Rescue

An overturned Luscombe 8-E float plane, kept a Vancouver, B. C., pilot and his passenger afloat for nearly seven hours before they were rescued by a passing trapper, in Bute Inlet on the B. C. coast recently. Pilot W. B. Sylvester and passenger Donald Houle of Port Alberni clung to the Edo floats of the overturned plane and burned paper money, including several $10 bills and other paper and bits of clothing, as a beacon until they were able to attract the trapper's boat. Sylvester said he had turned into a 20 mi. wind at full throttle for his takeoff from the inlet when a sudden gust of wind turned the plane on its back.

Parachutes at All Times

Old controversy over whether airplane passengers and pilots should wear parachutes is renewed in New York State with introduction of a bill in the state legislature at Albany recently, to require wearing of parachutes by persons in aircraft at all times during flight within the boundaries of this state. The bill has been referred to the judiciary committee, would have a far-reaching effect on charter services, nonscheduled operations, airlines and private flyers as well, and would presumably cause a boom in the parachute industry also if it were enacted.

4,000th Stinson

Sale of the 4,000th postwar Stinson Voyager, reported recently, gives the Stinson division of Consolidated Vultee Aircraft Corp. the total volume of more than half of all four-place planes sold postwar, with dollar volume totalling more than $24,000,000. Hugh V. Tull, Plainview, Tex., industrial machinery dealer, bought the plane, which he uses to commute between his branches at Plainview, Abilene, Odessa, and Amarillo. Claude Hutcherson, Plainview Stinson dealer, made the sale.

BRIEFING FOR DEALERS & DISTRIBUTORS

DC-4 CONVERSION KITS—Perhaps a new high in stocking of parts for one airplane by any one firm has been reached by Industrial Associates, 375 S. Robertson Blvd., Beverly Hills, Calif., which has recently acquired through surplus purchases more than 10 standardized kits for converting military Douglas DC-4s to commercial standards. Conversion kits are complete except for seats, rugs and buffets which are not standardized. Company now has a Douglas inventory in excess of 3,200 parts numbers, and also stock parts for Lockheed, Pratt & Whitney, Wright, Ranger, Warner, Scintilla, Eclipse, Thompson, Resco and Purolator aviation equipment. Frederick C. May and Bernard F. Gira, partners in Industrial Associates, both were associated with Douglas during the war years. Prospect for immediate market for the kits prompted their venture into the big plane modification kit field.

FLORIDA AIRCRAFT REGISTRATIONS—A new Florida law, effective Jan. 1, requires that all aircraft owned by Florida residents and operated regularly in the state must have Florida aircraft registration certificates in lieu of personal property taxes on planes. Planes are registered through state motor vehicle commissioner with fees for private aircraft ranging from $5 for planes of 2,000 lb. gross wt. or less, to $25 for planes of 4,500 lb. gross or more. Aircraft for hire are licensed at $1 per 100 lb. up to maximum of $100 for planes weighing 6,000 lb. or more. An additional 25 cent service charge is made on each registration. Funds from registration fees go to Florida State Improvement Commission, 50 percent of which are to be spent on state aviation projects. Remainder is distributed to counties.

65 HP. LUSCOMBE CONTINUES—Luscombe Airplane Corp., Dallas, advises that it is continuing to produce its 65 hp. two-place Silvaire Standard, all-metal plane selling for $2,495 flyaway, and a 65 hp. Silvaire Special at $2,695. These, with four 85 hp. two-placers tagged at $2,995 and $3,595, give the company an eight model two-place line with what the company believes are the lowest priced all-metal two-placers in the 65, 85 and 90 hp. categories.

ASKS WAITING PERIOD—Roy L. Wood, vice president and general manager of S. A. Long, Inc., Wichita, reports that his company has received government orders to scrap approximately two-thirds of its WAA agency stock of surplus aircraft parts, originally valued at $18,000,000, by June 30, date of expiration of the life of War Assets Administration. Wood urges that a one to three year additional period should be allowed by Congress in order to be sure that the materials to be junked won't be urgently needed later in view of world conditions.

SEARCH AND RESCUE—Oregon State Board of Aeronautics is establishing a coordinated search and rescue system for planes reported missing in the state, using funds from state registration fees of pilots. State highway department, state police, state and national forestry services, sheriffs, Army and Navy planes, CAP, Coast Guard, CAA, flight operators, Red Cross medical units, newspapers and radio stations are all tied into the plan which divides the state into air and ground zones with a director for each zone. Under the plan search by air will be made as far out to sea as it is reasonably safe to fly.

SERVICE BY SNYDER—Snyder Aircraft Corp., Chicago Municipal Airport, has issued an attractive folder describing the completeness of service offered in the new Snyder hangar and shops to transient flyers using Chicago Municipal Airport. Free station wagon service to the nearest taxi or bus terminal, cleaning windshields and interior of ship, and immediate line inspection of the incoming plane to determine any extra service that might be needed, are provided. Hangar storage or tie-down is made available along with washing, polishing and accessory overhauls, as well as regular line servicing with gas and oil. The folder is being mailed to all transient flyers who use Chicago Municipal Airport.

SKYWAY ONE TERMINAL—Grand Central Air Terminal, Glendale, Calif., is bidding for recognition as the western terminal of the Skyway One airmarking transcontinental route for private flyers. Proximity of the field to downtown Los Angeles and Glendale, and extensive use of Los Angeles Municipal and Lockheed Air Terminal by scheduled airlines, is pointed out by Grand Central as reasons why the Skyway One aerial tourist should make his western base at the Glendale Field.

—ALEXANDER McSURELY

Here a Cherry riveter pulls aluminum rivets in a typical hard-to-reach, airplane assembly job.

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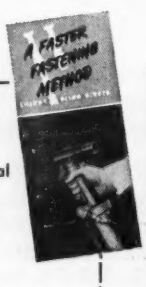

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FINANCIAL

Nominal Security Quotations Reflect Plight of Non-scheds

Inability to estimate capital necessary to survive is cited as one reason many non-certificated carriers have had to leave the industry.

A major phase of the air transport industry—the non-certificated lines—is experiencing its own particular financial difficulties at the present time. This is reflected in what almost amounts to nominal quotations for the securities of these companies.

It is possible that the plight of this segment of the industry has not received wider public notice due to the relatively limited marketability its securities.

Without exception, the securities of the publicly-held non-certificated carriers are traded in what is known as "over-the-counter" or unlisted markets. It is only after companies have become adequately "seasoned" with a record of sustained earnings and established operations that their securities "graduate" to the listed exchanges such as the New York Curb Exchange and the New York Stock Exchange. Yet, many a company with a very humble beginning whose securities received their first financial support in the unlisted markets is actively trading on the "big board"—the N. Y. Stock Exchange. For example, the equities of such companies as Pan American Airways and American Airlines were first available in the "over-the-counter" markets. In these instances, substantial profits, many times the original investment, were realized. It is this hope of making a financial killing by getting in on the ground floor that leads many investors and speculators to take risks in "unseasoned" securities of new enterprises. All too frequently, however, the risk factor is just as high if not higher than the profit potentiality. As a result, it is not uncommon for heavy losses to be incurred in commitments of this type.

▶ **Loss Pattern Consistent**—The loss pattern has been a consistent one among the securities publicly marketed by the non-certificated carriers. In no one instance does a single equity in this category currently command a higher market price than when first sold publicly. The accompanving table reveals this historical record.

Most of these shares were sold in the spring of 1945 and during the first half of 1946. The market atmosphere was very favorable for such sales. In the first place, aviation had wide popular appeal and effective salesmanship had little resistance to overcome in placing shares of these new companies. One banker even testified in a proceeding before the Civil Aeronautics Board that all that was necessary to sell these issues was to place the word "airline" in the corporate name of the company. There was little effort made by the investing public to discern the fine distinctions existing among these companies.

▶ **Few Survive, Others Fold**—As with all speculative stock flotations, a few benefit the investing public and survive, the others have their brief flurries and fold up in due time.

The indicated bid prices for the equities of most of these companies are a manifestation of the public's current appraisal of the doubtful ultimate survival of many of these units.

One company, Airborne Cargo Lines, has completed its corporate existence in the bankruptcy courts. Launched as Hoosier Air Freight Corp., this company subsequently changed its name to Airborne early in 1947. At that time Airborne's president stated that a "modest profit" was expected in 1947.

Expresso Aero Inter-Americano, through one of its officials, recently indicated that it was having a serious financial problem and was in need of considerable assistance. This company's stock has had a spectacular history. Under the sponsorship of Van Alstyne, Noel & Co., 300,000 shares were sold in May, 1945, at $3 per share and within a very short period were quoted around $10 per share. All this was done without any record of past earnings on the part of the company. Current quotations are around 60 cents a share.

▶ **Taca Cited**—Another interesting situation concerns itself with the earlier financing of Taca. To augment its huge expansion program, 500,000 shares of common stock were sold at $15.50. Shortly thereafter, these shares were quoted at around $25—all without any benefit of profitable earnings. The current market bid is around $1.75 per share.

It is fair to note, however, that the management complexion at present is completely changed and has very little relationship to its immediate past. Early last year, the Waterman Steamship interests assumed a dominant role in the management of the company and has been reported as instituting various reforms. Among other things, highly respected Paul Richter was subsequently installed as president and chief executive officer.

With the entrance of the Waterman interests there were a number of major financial changes. To provide additional capital, $1 million in new 4 percent convertible notes were sold. Of this amount, Waterman took $500,000, Pennroad Corp. $250,000 and others the balance. Various options on stock were also granted Waterman.

Probably the most important unit and the company capable of demonstrating recent profitability in the non-certificated group does not appear in the accompanying table. This is Slick Air and it is largely privately financed. More than $1 million debentures have been placed privately with certain investors.

There are many reasons why most of the non-certificated companies have floundered. Certainly, a good deal of under-estimation of the capital requirements necessary to survive is evident.

—Selig Altschul

Market History

Non-certificated Air Carriers
Traded In Unlisted Markets

Date Sold	Company	Shares Offered	Price to Public per Share	Current Bid Price per Share
Feb., 1946	Airborne Cargo Lines	170,000	$1.75	nil
Nov., 1945	Air Cargo Transport	300,000	3.00	$0.50
May, 1945	Expresso Aero Inter-Americano	300,000	3.00	0.60
April, 1946	Flamingo Air	135,000	2.00	0.375
May, 1946	Island Air Ferries	95,000	3.00	1.50
March, 1946	Latin American Air	99,166	3.00	0.25
June, 1946	Long Island Airlines	99,500	3.00	0.05
April, 1946	Flying Tiger Line	500,000	5.00	0.50
May, 1946	Taca, S. A.	500,000	15.50	1.75
April, 1946	Trans-Caribbean Air	99,000	3.00	0.50
June, 1946	U. S. Airlines, Inc.	900,000	3.25	0.375

AIR TRANSPORT

Certificated Lines Ask Monopoly On U. S. Governmental Air Travel

Air Transport Association opposes Air Force proposal which would permit uncertificated operators to participate in trans-Pacific movement of dependents.

By CHARLES ADAMS

A basic question of government policy toward certificated and uncertificated airlines has developed as the result of efforts by military officials to arrange trans-Pacific air transportation for about 2,000 dependents of Army personnel.

The Air Force proposed dividing the traffic among the two U. S. flag carriers flying the Pacific—Pan American Airways and Northwest Airlines—and two major uncertificated operators—Pacific Overseas Airlines and Transocean Air Lines. Admiral Emory S. Land, president of the Air Transport Association, has informed W. Stuart Symington, Secretary of the Air Force, that "any determination of policy by the Air Force which would deprive the certificated carriers of needed traffic moving over their routes is contrary to the national interest."

▶ **New Policy Urged**—ATA urged the government to establish a policy of employing certificated carriers to perform needed government transportation "in every instance where the facilities of the certificated carriers are adequate to perform the service." The airline group asked that the government cease its practice of employing noncertificated carriers for this purpose.

The Air Force recently called a meeting of the four carriers to outline its requirements for transporting 500 passengers a month from the West Coast to Tokyo, Okinawa, Manila and Guam over a four-month period. It was also requested that the air carriers quote a rate per person for the transportation.

▶ **Fares Listed**—Pan American and Northwest currently charge $650 for a one-way trip from West Coast points (Los Angeles, San Francisco and Seattle) to Tokyo. Transocean and Pacific Overseas point out that a 10 percent tariff reduction would enable the government to save $130,000 on the movement of 2,000 passengers.

The two certificated carriers attacked the suggestion that they establish special low fares for the Army business. They said it might be discriminatory and a violation of the Civil Aeronautics Act.

▶ **Viewpoint Given**—Admiral Land told Secretary Symington he did not concede that the proposed trans-Pacific transportation could be conducted legally by the uncertificated carriers on a contract basis. He also pointed out that uncertificated carriers are definitely barred from common carriage of passengers to foreign points.

ATA said the Air Force's determination to arrange for less-expensive air transportation conflicts directly with the government's prior action in certificating Pan American and Northwest to the Orient. "Carried to its logical conclusion, it will go far to thwart the purpose of such certifications generally."

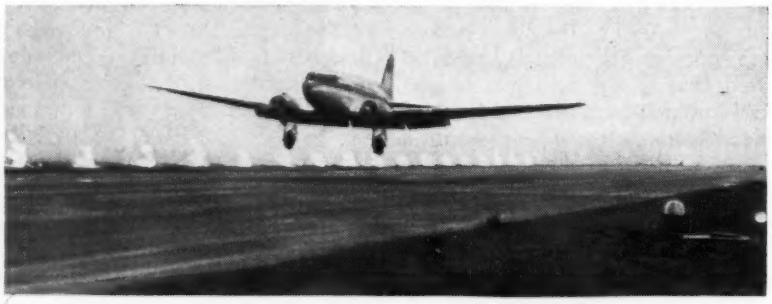
▶ **Double Charge Seen**—"It must be recognized that if the Air Force gives half of this proposed movement to the noncertificated carriers involved, the government will in effect be paying twice for this transportation. For some time both [PAA and NWA] will require financial support from the government through mail pay. The Air Force now proposes to employ noncertificated carriers to transport a large block of traffic, thus depriving the certificated lines of revenues which otherwise would contribute to their total revenues, and would reduce the financial support which the government will otherwise be called on to pay."

Land claimed that uncertificated carriers operate under "very limited and general safety regulations which do not match in severity the regulations applicable to certificated lines." He added, however, that he did not intend to assert that Pacific Overseas and Transocean conduct unsafe operations.

▶ **Impressive Records**—Both Pacific Overseas and Transocean built up impressive records in serving the armed forces on a contract basis during 1946 and the early part of 1947. In addition to flights for the Air Transport Command, both POA and TAL have conducted extensive contract services for various United States government agencies.

Pacific Overseas performed practically all the overseas air carriage in the Pacific for UNRRA, and Transocean is now engaged in transporting about 740 passengers monthly from the West Coast to Guam and Okinawa for essential national defense construction on those islands. They point out that the requirements of these services were more than could be met by existing schedules of the certificated carriers and that the operations were effected at a substantial saving to the government.

▶ **Defense Aid**—In both military and commercial contract operations Pacific Overseas and Transocean have flown a combined total of 207,600,000 passenger miles without passenger or crew injury or fatality. The two uncertificated lines contend it is in the best interest of national defense for the government to continue to use air carriers which, by



COMMERCIAL FIDO LANDING

Photo shows Southwest Airways DC-3 making first commercial FIDO landing at Arcata (Calif.) Landing Aids Experiment Station. Visibility before FIDO burn was ¼-mi. After burn was ¾-mi. plus. Ceiling before burn was 75 ft.; 300 ft. plus after burn. Fuel cost of burn was $51.76 for 647 gal. diesel oil at $0.80/gal. On that day, despite terminal weather conditions, SWA completed all Arcata schedules; made two FIDO landings and three FIDO takeoffs. Assisting landing aids used were radio range, compass locators, SCS-51, GCA, approach and runway high intensity lights. Landing was made in December, 1947. FIDO burn costs at Arcata now range from $24 to a maximum of $135.

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their very nature, can meet unusual and emergency requirements.

It is understood that neither Pacific Overseas nor Transocean is opposed to sharing the traffic involved in the Army movement with Northwest and PAA. But both uncertificated lines believe that NWA and PAA do not have space available to handle the entire job within the specified four months.

▶ **Extra Sections**—To handle the traffic, both Pan American and Northwest reportedly would have to add extra sections to their regular flights. It is pointed out that no mail compensation would be granted for such special sections, and thus the government would not be paying twice for its transportation by patronizing contract carriers.

Some observers contend that PAA and Northwest actually would stand to profit by accepting only part of the traffic involved in the mass movement. They reason that the Army dependents could be used to maintain a high load factor on regular mail-carrying schedules. But if extra sections are flown to handle the surplus Army traffic, the return trips to the U. S. would probably be expensive deadheads.

WINTER OUTFITS

Stewardesses on Pan American's Alaska run between Seattle and Fairbanks have been outfitted with new fleece-lined boots, ski pants and parkas. Edith Fields (left) and Charlotte Halverson model the new outfits. The girls need uniforms when they stay over in Fairbanks or Juneau. The parka is made by the Jensen Manufacturing Co., Seattle.

Colonial to Receive Incentive Mail Pay

Colonial Airlines has accepted a CAB proposal which will give the carrier an estimated 5 percent profit on its Bermuda services through next month and which will make Colonial the first overseas operator to receive incentive mail pay.

For the period Aug. 1, 1947 (when Colonial began its Bermuda services), to Feb. 29, 1948, the carrier will receive total mail pay of $343,500, equal to 91 cents a plane mile. CAB estimates a 5 percent profit will result during the seven-month period.

▶ **Sliding Scale**—During the two-year development period Mar. 1, 1948, to Feb. 28, 1950, Colonial's Bermuda mail pay will be geared to its passenger load factor in accordance with an incentive rate formula already set up for Pioneer Air Lines and Continental Air Lines. When the carrier's passenger load factor on its 44-seat DC-4s is 55 percent, the mail rate will be 31 cents a plane mile.

For each one percent increase in the passenger load factor above 55 percent (up to 67 percent) the mail rate will decrease 1.75 cents a plane mile to a minimum of 10 cents a plane mile. For each one percent decrease in the passenger load factor below 55 percent (down to 43 percent) the mail rate will increase 1.75 cents a plane mile to a maximum of 52 cents a plane mile. Since revenue derived from a one percent increase in the passenger load factor is more than will be lost from a 1.75 cent decrease in mail pay, the carrier has every incentive to boost passenger volume.

▶ **Large Profit Possible**—If Colonial achieves its anticipated average 55 percent load factor during the year beginning Mar. 1, 1948, it will earn nearly 6 percent profit. A 70 percent load factor would yield around a 20 percent profit, while a load factor under 48 percent would result in a loss.

CAB said the sliding scale rate formula should minimize the need for frequent mail rate revisions attributable to uncertainties in predicting Colonial's passenger traffic. After Mar. 1, 1950, Colonial is to receive 75 cents a ton mile mail pay subject to a minimum capacity factor (false load) of 500 lb. on trips outbound from the U. S.

▶ **Traffic Gains**—Load factor on Colonial's routes from New York and Washington to Bermuda rose from 19.9 percent in August to 31.4 percent in September, 37.9 percent in October, 38 percent in November and an estimated 40 percent in December. In March and April, at the height of the tourist season, load factors are expected to jump to 74 and 83 percent, respectively.

Latin American Lines Apply for U. S. Links

Two more Latin American carriers, Aerovias Nacionales de Colombia (Avianca), Bogota, Colombia; and Aerovias Guest, Mexico City, have asked CAB for foreign air carrier permits covering new links to the U. S.

Avianca seeks to operate between Bogota and/or Barranquilla, Colombia, and New York via Jamaica, Havana and other points. The carrier already holds a foreign air carrier permit to fly between Colombia and the Canal Zone and between Colombia and Miami.

Aerovias Guest has applied for a link to New York and for authority to make Miami an intermediate stop on a proposed service from Mexico City to Lisbon, Madrid, Paris and London via Bermuda and the Azores. The line plans to use Constellations.

American Overseas Boosts Operations

American Overseas Airlines flew a total of 174,500,000 passenger miles averaging more than five trans-Atlantic crossings daily, in 1947, showing an increase in passengers carried of 82 percent over 1946, and an increase in cargo and mail covered of 62 percent.

Harold R. Harris, vice president and general manager, reported that AOA's total passenger volume for the year exceeded that of any other North Atlantic air carrier, U. S. or foreign. Passengers carried for the year totaled 63,570, while 2,860,000 lb. of cargo and mail were carried.

AOA added service to Reyjavik, Iceland; Glasgow, Scotland, and Helsinki, Finland, during 1947 bringing total number of foreign countries served to 11. As of Dec. 31, American Airlines System had completed 15,620 trans-Atlantic crossings, and on Nov. 21 hauled its 100,000th passenger, not including wartime military traffic, since inauguration of trans-Atlantic service in 1942.

At year's end AOA operated a fleet of seven Constellations and seven Douglases. In 1948 AOA expects to place in service one or more double-decker Boeing Stratocruisers of which eight are on order.

WAL Appoints James As Director of Safety

Western Air Lines has appointed C. N. James as director of safety, a new post created in accordance with recommendations made recently by President Truman's Special Air Safety Board.

In its final report issued this month (AVIATION WEEK, Jan. 12), the special board urged all airlines to name a full-time director of safety at a sufficiently high management level to enable proper observation, analysis and planning to achieve a higher degree of safety. James, who has been on leave of absence for the past six months because of illness,

will report directly to WAL president T. C. Drinkwater.

Other personnel developments:

• **American**—John R. Wiley, formerly assistant to the vice president-operations, has been named to the newly-created post of director of the inventory control division.
• **BOAC**—Sir Harold Howitt, deputy chairman since May, 1943, is slated to retire Mar. 31. He will be replaced by Sir Miles Thomas.
• **Capital (PCA)**—J. O. Urquhart has been named manager of special events. He will be coordinator of all special flights and will attempt to expand PCA's charter operations.
• **Northeast**—Eugene Ostheimer, former passenger traffic manager for Chicago & Southern, has been appointed director of tariffs and schedules for Northeast Airlines.
• **Northwest**—E. B. Curry has become general superintendent of aircraft maintenance.
• **Pan American**—Rahland C. Zinn has been named division engineer for PAA's Latin American operations. He succeeds Joseph J. Dysart, who has been transferred to New York as division engineer of the Atlantic sector. . . . Paul T. Rennell has become superintendent of cargo agencies for the entire Pan American Airways system.
• **United**—John W. Newey, vice president-finance, has been granted six months' leave of absence to accept an assignment representing all the airlines in negotiations on joint airport matters on the Atlantic coast. . . . E. P. Lott has been named manager of flight dispatch in the eastern area.
• **West Coast**—Maurice Stacy has become assistant general sales manager.

CIO Wins Election

The American Communications Association (CIO) reports it has been chosen to represent TWA teletype operators, overseas flight radio officers and ground radio officers as the result of a recent National Mediation Board bargaining election. The Airlines Communications Employes Association (ACA affiliate) received 203 votes to 61 for the Skylines Association of Radio Operators, an independent union which has represented the employes for eight years.

Alaskan Cargo Exemption Hit

Certificated airlines criticize benefits for 'worst violators' of Civil Aeronautics Act.

Indication of whether the Civil Aeronautics Board—minus the influence of former Chairman James M. Landis—is still inclined to back liberal exemptions for all-cargo carriers is expected shortly.

CAB last week scheduled oral argument on a proposal to permit uncertificated lines to conduct scheduled common carrier freight service between continental U. S. and Alaska pending determination of their applications for certificates of public convenience and necessity. The contemplated new section 292.7 of CAB's Economic Regulations parallels a previously promulgated section 292.5, under which 11 freight lines already have gained interim common carrier privileges to serve non-Alaskan points.

▶ **Opposition Forms**—Pan American Airways and Northwest Airlines are leading the opposition to section 292.7. PAA told CAB that its contemplated action is illegal and intimated that the new regulation seeks to confer benefits on the very carriers which have, PAA claims, been among the worst violators of the Civil Aeronautics Act in the past.

Despite the fact that uncertificated operators on the Alaska-Pacific Northwest run are only permitted to fly on a "casual, occasional, infrequent and nonscheduled basis," certain of the carriers have in fact flown more than daily service on a scheduled basis in recent months, PAA declared. A Pan American brief said flights by uncertificated carriers between Alaska and the Seattle gateway numbered 195 in August, 1947; 151 in September, 148 in October, and 115 in November.

▶ **Violations Condoned**—"No one visiting Seattle could believe there are only two carriers certificated between Alaskan points and Seattle," PAA stated. "The natural impression gained is that scheduled [passenger and cargo] service is available from at least 10 airlines who operate openly on exactly the same basis as Pan American [and Northwest]."

PAA said the only reason CAB is considering section 292.7 is that the Civil Aeronautics Act has not been enforced with respect to transportation between the U. S. and Alaska. "And there are always those who will recommend the easy course of condoning a bad situation rather than the harder one of rectifying it."

▶ **Loss Cited**—Pan American indicated that illegal operations by uncertificated carriers accounted in part for its loss of over $1,000,000 on U. S.-Alaska service in the first 10 months of 1947. The certificated line said its load factor, including cargo, was less than 50 percent last year "with seats and cargo space going empty because traffic was being drained off by services which should not have been operating."

The uncertificated operators take advantage of a double standard of safety requirements, Pan American told CAB. "Illegal operators fly at higher gross loads, with lower fuel reserves, lower weather minimums, no required route checks for flight personnel, and with few requirements as to radio aids. All this makes a tremendous difference when transferred into costs."

▶ **Rate Wars**—"In addition, illegal operators engage in rate wars. Either they fly on no tariffs or they make no effort to comply with tariffs which they do file and publicize. Last summer, chaotic conditions resulted when Alaska Airlines reduced passenger fares far below compensatory rates."

Pan American said the proposed exemption for all-cargo carriers is uneconomical and unworkable, since 89 percent of the air cargo available on the Alaskan run is northbound. PAA added that the uncertificated carriers inevitably would be forced to carry passengers to make a profit despite CAB's proposed prohibition against such operations by lines receiving the cargo exemption.

▶ **Carriers Named**—Eleven companies certificated in Alaska and 13 uncertificated lines which flew six or more trips between Alaska and continental U. S. between Aug. 1, 1947, and Oct. 30, 1947, would be eligible for exemption under 292.7, Pan American said. The uncertificated lines are: Northern Airlines, Mt. McKinley Airways, Golden North Airlines, Trans-Alaskan Airlines, General Air Cargo, Arnold Air Service, Standard Air Cargo, Totem Air Service, Pearson-Alaska Airways, Pacific Alaska Express, Lavery Airways, Sourdough and Columbia Air Cargo.

Alaska Airlines (certificated within the territory) told CAB that proposed section 292.7 is one of the most constructive steps toward development of Alaska ever taken by a government agency. Also backing more air cargo service to Alaska were J. A. Krug, Secretary of the Interior; John Nicholas Brown, Assistant Secretary of the Navy; Ralph J. Rivers, Attorney General of Alaska, and a number of merchants within the territory. They cited the frequent maritime strikes and inadequate road and rail facilities as reasons for more air service.

▶ **New Traffic Seen**—In its brief to CAB, Alaska Airlines said it was convinced that substantial southbound cargo traffic (mostly fresh fish and crab) can be developed. The company said that in October, 1947, it flew 104,000 ton miles of southbound freight in addition to 317,000 ton miles of northbound cargo.

Pan American and Northwest have failed to develop cargo on their other routes where little competition exists, Alaska Airlines declared. "Their performance in Alaska is typical of their overall failure to appreciate the possibilities of air cargo.

"In August, 1947, Alaska Airlines carried more cargo on its contract and irregular common carrier operations between Alaska and the U. S. than was handled on the entire domestic system of Northwest Airlines in that month—and more than was carried on PAA's Alaskan, Pacific and Atlantic operations combined.

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SHORTLINES

▶ **American**—Has announced a "Flagship Creditravel Plan" whereby a prospective air traveler may obtain quick loans for trips to Europe, Mexico, Canada and within the U. S. under an agreement with the Irving Trust Co., New York, and other banks in AA cities. Money may be obtained in as little as 24 hours for a complete package trip, including tours, hotels and incidentals.

▶ **BOAC**—Company's foreign air carrier permit has been amended by CAB to designate Washington, D. C., and New York as co-terminals with Baltimore on the Bermuda run.

▶ **Capital (PCA)**—Immediate use of ILS is contemplated following CAA's announcement that the carrier had been approved for the landing aid. Installation of necessary equipment on PCA planes has been completed, and flying personnel has received extensive training in the use of ILS.

▶ **Eastern**—A Constellation flying nonstop from Miami to New York attained what EAL officials believe to be the fastest speed ever made by a commercial airline. Carrying 55 passengers and a five-man crew, the craft made the flight in 2 hr. 41 min. 30 sec., reaching a top speed of 565 mph. and averaging 421 mph.

▶ **KLM**—Has completed its 100th roundtrip flight across the south-Atlantic from Amsterdam to Rio de Janeiro and Montevideo. Carrier has handled 6,200 passengers and 72¼ tons of freight and mail since starting the service Aug. 6, 1946.

▶ **Philippine Air Lines**—This month adjusted its fares from San Francisco to Shanghai and Hong Kong to conform with those of Pan American Airways. Action was in keeping with resolutions passed at the recent International Air Transport Association conference held in Rio de Janeiro which called for all of its member airlines to equalize their fares between common points of service.

▶ **Pioneer**—Has joined the growing list of carriers offering to provide passengers with hotel reservations at their destination. Reservations are made by notifying the ticket agent at the point of departure.

▶ **Robinson Airlines**—Carried 21,296 revenue passengers on its New York intrastate routes in 1947—nearly double the 1946 total. The Ithaca-based company has completed 33 months of scheduled operation.

▶ **Slick**—Flew 21,937,071 revenue ton miles of freight in 1947, compared to 11,198,594 in 1946, the company's first year of service. Overall average load factor last year was 79 percent. Carrier flew over 2,000,000 freight ton miles during each of the last four months of 1947: September 2,034,411, October 2,519,871, November 2,096,143, December 2,068,681. Number of employes is 470.

▶ **United**—Flew 1,872,764 ton miles of freight and express in December, up 20 percent over the same month in 1946. Airmail tonnage for the month was down 10 percent.

Domestic Carriers Go Deeper in Red

Badly crippled by the DC-6 grounding, the 16 domestic trunklines suffered one of the worst months in their financial history during November, with every one of the carriers operating in the red.

November's operating loss of about $5,675,000 brought the domestic airlines' deficit to more than $15,555,000 for the first 11 months of 1947. Operating loss for the 16 carriers in November, 1946—a month sharply affected by the TWA pilot strike—was about $4,665,000.

Overall domestic deficit for 1947 now seems certain to approach the $20,000,000 mark. Operating loss for 1946 was about $5,500,000.

United Air Lines and American Airlines, hardest hit by the DC-6 grounding, showed operating losses of $2,063,000 and $1,397,000, respectively, last November. Next highest losses for the month were: TWA $448,000, Northwest $343,000, Eastern and Delta $247,000, Western $231,000, National $175,000 and Braniff $110,000.

Passenger traffic during the late fall continued to fall behind the same 1946 period. Revenue passenger miles flown by the 16 domestic trunklines in November, 1947, aggregated about 427,686,000 against 466,775,000 in November, 1946.

CAB SCHEDULE

Jan. 27. Hearing on TACA, S. A., foreign air carrier permit renewal and amendment case. (Dockets 3016 and 3017.)

Jan. 28. Hearing on requests of Braniff and Chicago & Southern for removal of restrictions on Chicago-Houston service. (Docket 1681 et al.)

Feb. 2. Hearing on Board's investigation of airfreight rates. (Docket 1705 et al.)

Feb. 4. Hearing on Continental Air Lines' route consolidation case. (Docket 576 et al.)

Feb. 9. Hearing on Mid-Continent's application for alternate Kansas City-New Orleans route. (Docket 1956.)

Feb. 21. Hearing on Mid-Continent's Minot, N. D.-Regina, Saskatchewan, route case. (Docket 628.)

Mar. 1. Hearing on additional service in Hawaiian Islands. (Docket 2390 et al.)

Two New Feederlines To Inaugurate Service

Two new feeders—Wisconsin Central Airlines, Clintonville, Wis., and Piedmont Airlines, Winston-Salem, N. C.—are slated to begin service next month, bringing the total number of short-haul carriers in operation to ten.

Wisconsin Central's Lockheed Electras are to start serving 15 of the 34 points on the system on Feb. 1. Initial flights will stop at Chicago, Ill.; Racine-Kenosha, Milwaukee, Madison, Baraboo-Portage, Oshkosh, Clintonville, Stevens Point-Wisconsin Rapids, Wausau, Rhinelander and Eau Claire, Wis.; Hibbing-Chisholm, St. Cloud and Minneapolis-St. Paul, Minn.; and Superior, Wis.-Duluth, Minn.

About Feb. 14, Piedmont plans to inaugurate one roundtrip DC-3 flight daily between Cincinnati, Ohio; Lexington, Ky.; Bristol, Va.; Asheville, Charlotte, Southern Pines-Pinehurst-Aberdeen and Wilmington, N. C. Service between Louisville and Lexington, Ky.; Bristol, Va.; Winston-Salem, Greensboro-High Point, Raleigh-Durham, Goldsboro and New Bern, N. C., is scheduled to start about Feb. 20.

Piedmont has asked CAB for not less than 60 cents a plane mile mail pay for its first six months of operation. As with other short-haul carriers, the rate will drop to 55 cents a plane mile the next three months and decline 5 cents more each succeeding three-month period until approximately 18 months from the inauguration of service mail pay will be 35 cents a plane mile.

Industry Hails Report By Policy Commission

The President's Air Policy Commission report issued this month (AVIATION WEEK, Jan. 19) has received warm indorsement from all segments of the air transport industry.

Warren Lee Pierson, chairman of TWA's board of directors, termed the report "evidence of real understanding of the problems of the scheduled airlines." He said the study is almost entirely consistent with the views of the larger carriers, adding that the Commission's recommendations relative to government responsibilities are "heartening to the industry."

Other statements of approval were issued by E. V. Rickenbacker, president of Eastern Air Lines, and W. A. Patterson, president of United.

David L. Behncke, president of the Air Line Pilots Association, said the policy group's indorsement of the Independent Air Safety Board idea is a substantial contribution to the solution of the air safety dilemma.

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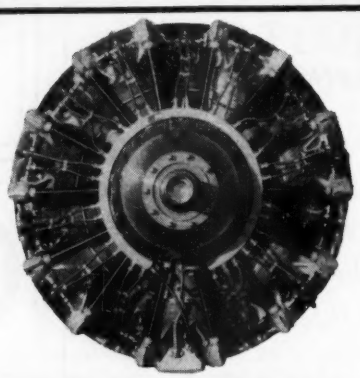

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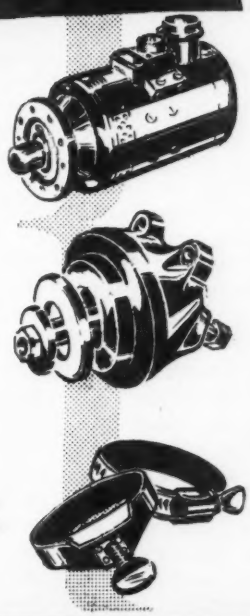

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EDITORIAL

Long Range Question

Must air transportation look always to the Federal government for succor? Is it content to pile request upon request for more mail pay, and higher fares, yet demand that the government outlaw a trial by those who seek to show—for free—whether it is possible to operate more efficiently at lower rates?

It required pioneers like Slick, the Flying Tigers and Willis to prove to the certificated airlines how much cargo business could be sold by enough work. The major members of the Air Transport Association then "boldly" cut cargo rates to meet this competition, at the same time they were raising passenger fares and appealing to the government and the taxpayers for more mail money, and getting it. The independents, still without direct subsidy of any kind, manage to carry on.

The attitude of the public seems to be that if skinny, brazen, unknown but wide-awake go-getters like the uncertificated, unsubsidized companies could land so much new business, why couldn't the experienced, certificated carriers?

These are not petty questions. This is not any personal "dispute." We admire those accomplishments the ATA's members have chalked up. But many taxpayers are asking sincerely for answers. And it is idle to think they will stop asking. Is there no outlook for air transportation except bigger and better government crutches? And why, the naive taxpayer asks, isn't the government giving a fair chance to those who claim they can fly and serve the public without subsidy. Consider Santa Fe Skyway.

Skyway was one of the most efficient uncertificated air freight lines, backed by an outstanding railroad. It ceased operations Jan. 15 because of the CAB's "obviously unfriendly attitude."

Yet Santa Fe Skyway has never asked for any kind of government subsidy, or equipment development hand-outs. Its officials expressed themselves content to provide airlift in the cargo field only, and offered a plan of air-surface coordination that would have expedited freight to hundreds of communities now without air service. Furthermore, Skyway's efforts, like those of the other outstanding air freight lines, would have generated air freight tonnage to increase the revenues of virtually all other air carriers.

As Skyway's parent company pointed out in its petitions for consideration by CAB, the Atchison, Topeka & Santa Fe is a vital participant in the economic life of hundreds of cities and towns along its 13,000 miles of mainline rails in 12 states from Chicago to the Gulf and California. Many thousands of businesses of all kinds, including the retail trades, farming, cattle raising, mining, lumbering and manufacturing, are in various degrees dependent upon the Santa Fe. Many of these communities were brought into being because of the existence of the railroad. The railroad's active interest in air freight was stimulating air cargo business through the rail system. There was considerable evidence that the certificated airlines were benefitting as much as the Santa Fe's own airline subsidiary.

Skyway was backed by the resources of a company with a net worth far exceeding that of the entire air transport industry.

"Because of the failure of the Civil Aeronautics Board for over one year to hear Santa Fe's comprehensive plans for participation in air cargo operations and because of the Board's action Dec. 5 denying interim common carrier rights to Skyway, there is lost to the nation a going air transport operation with know-how and financial resources sorely needed to help broaden and make sound the base of the air transport industry," one company spokesman said.

"Santa Fe's program would have steadily brought into beneficial use many costly airports in an area where only about a third of the class III or larger landing fields now give the limited service of retrenching civil airlines." It would have done this without Federal aid.

Santa Fe flew 2,015,000 plane miles. In October it was flying freight at the rate of about 16,000,000 ton miles a year. Without common carrier authority Skyway found it necessary to refuse more than twice as much freight tonnage as was carried for regular shippers under contract. It never had an accident in the air. Only one scheduled revenue flight was canceled by mechanical failures since Skyway started July 31, 1946. It had 140 employes. Flying, and mechanical standards were high. "At a time when the nation is committed to superior air power, a part of which is 200 to 300 percent increase in civil airlift, the CAB attitude toward Santa Fe does not represent thinking based on public interest," a spokesman contended.

At this point, we are not ready to advocate declaration of a policy permitting surface carriers full rights to operate airlines. But we do agree with the President's Air Policy Commission when it says:

"If the Board finds that the public convenience and necessity does require some additional common carrier operators, we hope that it will give weight to the records built up by any of those contract carriers that have proven their ability to operate economically and efficiently and now desire common carrier status."

We agree at this time with the Commission's recommendation "that the CAB prevent the control by surface carriers of the U. S. air transport system or any important segment thereof." And we also agree when it says:

"We believe, however, that individual progressive surface carriers, desirous of developing air transport as a part of a coordinated service, should not be automatically prevented from such action simply on the grounds that they are surface carriers—as now appears from the record to be the case. We recommend that the Congress enact legislation clarifying these two points."

The CAB has been derelict in its duty in the Santa Fe Skyway case. It has denied the tax-ridden American people another yardstick with which to measure the service and rates it is paying for. We cannot go along with those who say that the Santa Fe's case was the railroads' foot in the door. As long as Skyway operated generally over its railroad territory it could have been considered a coordinated system. Various other legal restrictions might have kept it in experimental status. The contention of the old line air carriers that it was robbing them of business the American taxpayer was already paying for is to deny that Santa Fe was creating new business for the industry.

Santa Fe Skyway, asking nothing from the government, was serving business and industry. It was operating as a check on those who claim subsidy is necessary to perform an adequate public service. Some day Congress must decide on some line of demarcation between the one extreme of high subsidy and those who claim they need none. Until it meets this problem squarely the public is not getting the most for its money.

ROBERT H. WOOD

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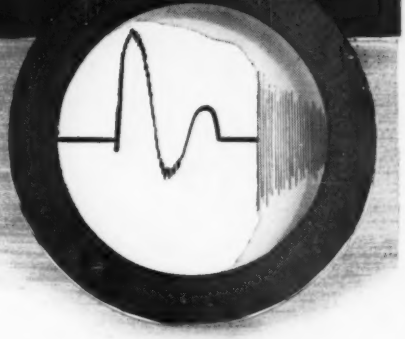

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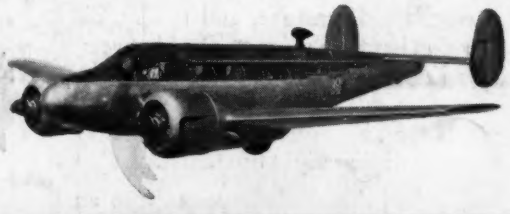

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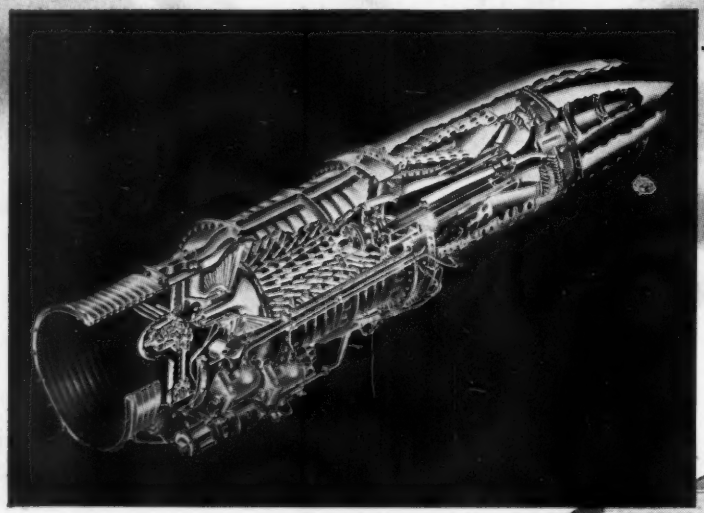

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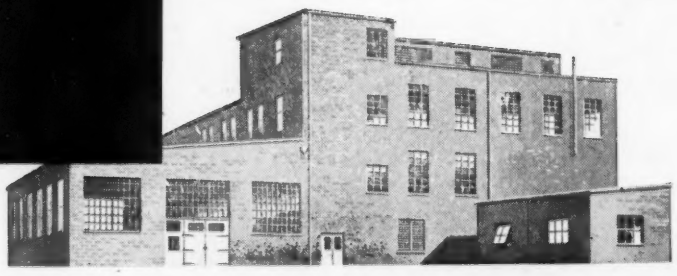

The Birdmen's Perch

By *Major Al Williams*, ALIAS, "TATTERED WING TIPS,"
Gulf Aviation Products Manager, Gulf Bldg., Pittsburgh 30, Pa.

We liked this story.

A fella we know sat down at an unfamiliar airport, ready for the worst.

Almost before he got off the runway, an attendant was at work wiping off the windshield and the drops of oil from the cowling. Next, the grease monkey asked if there was anything he could do for our visiting friend . . . and he asked it *cheerfully!*

When our friend asked about hotel accommodations, it turned out that the airport operator had a standing arrangement with the town's best hotel, where a good room was available. Transportation to town was also provided, and reasonably.

Next day, our pilot friend found his plane "on the line," serviced and ready to go *at the appointed time.*

He went his way, loudly praising the splendid (and shrewd!) service policies of the airport operator . . . and has been doing so ever since, a fact which hasn't hurt that airport's business any!

We told you we liked this story . . .

You see, the airport operator is one of our Gulf Dealers!

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Did we ever mention how many of the Gulf gang hold pilot's licenses?

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Now when we tell you the Alchlor Process is an *extra* refining step which takes *extra* impurities out of Gulfpride Oil we're depending upon our research men and lubrication engineers for information.

But when we tell you that Gulfpride Oil gives extra lubrication . . . helps get the most and smoothest horsepower out of your engine, we're depending on the

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We're still waiting for enough mail to show clearly whether you wish to continue the LITTLE KNOWN FACTS DEPT. or want to switch to something like FAVORITE FLYING GRIPES, or what have you.

Meanwhile, we're going to make a few more Perch Pilots, as follows:

Jack H. Carroll, Nogal, N.M., gets the first commission as Perch Pilot (bottom rung) because:

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"Though it weighs nearly twice as much as a B-29, a B-36A can operate from any B-29 runway!"

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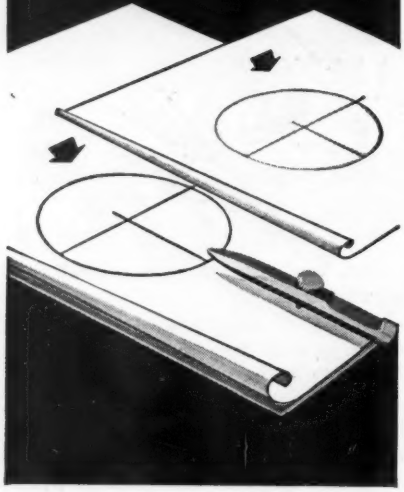

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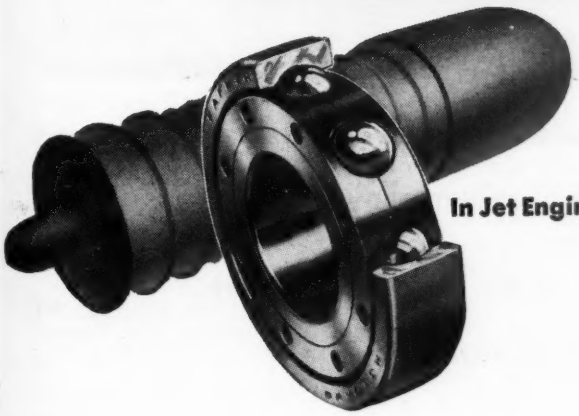

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Working with the most complete line in America, Fafnir engineers are in a preferred position to team up with aircraft designers and engineers to solve any bearing problem. The Fafnir Bearing Company, New Britain, Conn.

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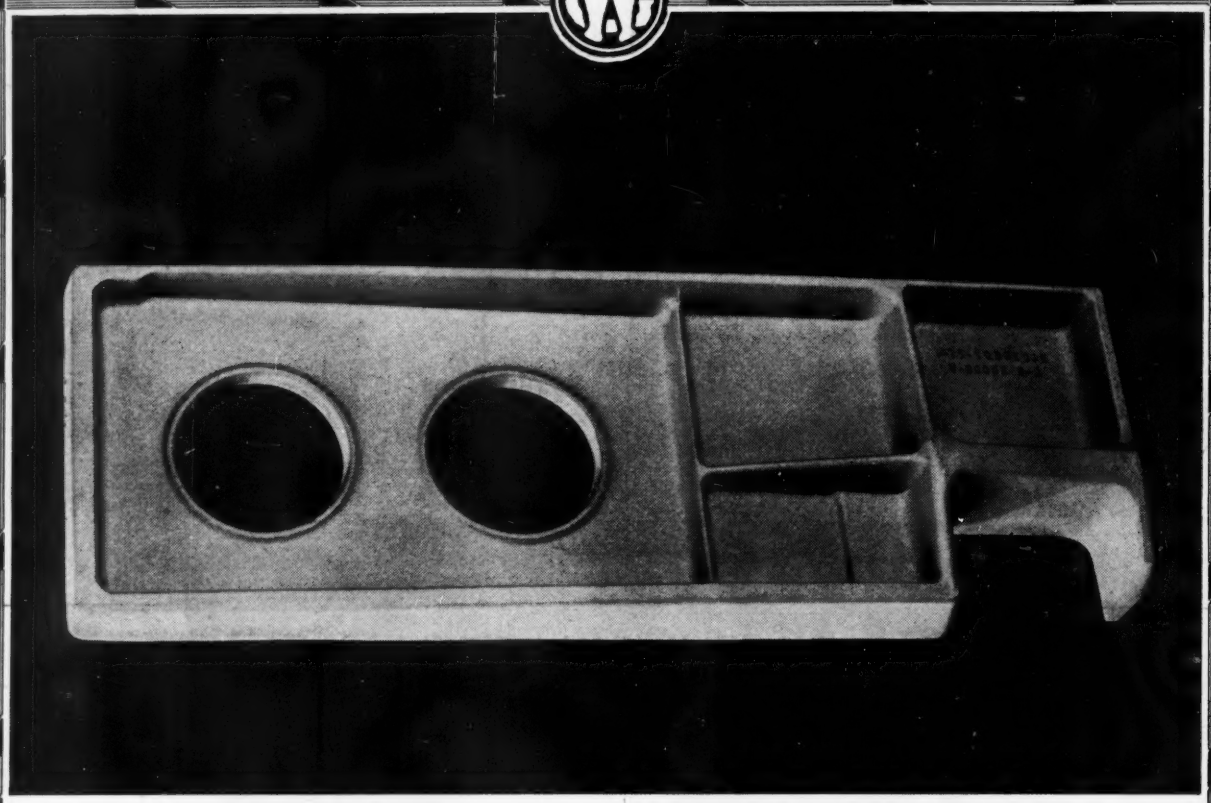

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NEWS SIDELIGHTS

Flight Pay on Griddle

Members of a House Military Appropriations Subcommittee intend to grill top Air Force officials on why flight pay is paid to Maj. Gen. Laurence Kuter, now serving as U. S. delegate to ICAO, and other general officers. The appropriations group can force USAF to eliminate non-operational officers from receiving flight pay by slashing allocations for the purpose—which it intends to do.

Flight pay, the subcommittee's chairman, Rep. Albert Engel, points out, was intended to compensate for exceptional risk, but is now being drawn "by a pack of generals who simply stay up in the air for a required number of hours." Approximately $4,500 of Kuter's $15,000 annual salary is flight pay. Elimination of this would almost scale his USAF earnings to the $10,000 a year received by CAB members.

Airlines Eye Reeves

If Adm. John W. Reeves Jr. decides to retire from the Navy after the ATC-NATS merger is set, several airlines will be bidding for his services, with Pan American the leading contender, NATS' outstanding record in safety and operational efficiency combined with the Admiral's chronic cost-consciousness would make him a valuable addition to a commercial air operation, industry people say.

Capital-Minded Hughes

Since Howard Hughes' forcible introduction to Washington politics last year he has continued an active interest in Washington aviation politics. Glenn Williamson, former Eighth Air Force officer who later became executive assistant to Secretary of Commerce Averill Harriman, is the latest addition to the Hughes Aircraft Co. payroll. Hughes has been active on behalf of several candidates for CAB vacancies and is supporting Joseph Marriott, CAA sixth region administrator, for the top CAA post soon to be vacated by T. P. Wright.

ALPA'S Big Chance

Air Line Pilots Association is embarrassed by its inability to recommend a suitable candidate for the post of CAB Safety Bureau director, which has been vacant since the resignation of Wallace Dawson last August. Former CAB Chairman Landis offered the post to an ALPA-approved airline pilot to give the union a chance to do something about its claim of having been neglected on airline safety problems. Many top airline pilots, including H. B. Cox of American, Bob Buck of TWA, and J. E. Wood of Western, who have been carrying the safety ball for ALPA in Washington hearings, have refused the post primarily because its $9,975 salary is too far below the $12,000-$14,000 level of high seniority airline pilots. With the passing of Landis, ALPA may have muffed its chance and given a hollow ring to its future safety recommendations because of the unwillingness of the pilots to step into a position of safety responsibility.

CAB Litigation Paralyzed

CAB members freely admit that their police arm remains almost paralyzed by lack of personnel. The Board's enforcement and litigation section consists of nine employes, including stenographic help. To date, only the worst violators among uncertificated carriers have received special attention from the enforcement section —and then only after long delay.

Airline War Training?

The President's Air Policy Commission recommendations for peacetime preparation of the airlines for emergency mobilization are being discussed by a civilian group with top Air Force administrators. Some kind of war training program would be resumed.

The group, including Col. Tom Hardin, Grove Webster, Sam Solomon, Jerome Lederer and others, are formulating a plan by which airline pilots would receive commission qualification credits for classroom and flight instructions in procedures, logistics and operational problems. Sam Solomon headed the previous airline war training program and will play a major role in working out the details of the plan based on his wartime experience.

Uncertificated Carriers Worried

Two of the three remaining CAB members have manifested concern that they overstepped their powers under the Civil Aeronautics Act in granting exemptions to uncertificated carriers. Vice Chairman Ryan and Member Branch recently showed deep interest not only in the legal arguments against the proposed exemption of all-cargo operators on the U. S.-Alaska route but also in intimations that CAB promulgated without proper authority the existing nonscheduled exemption (section 292.1 of the Economic Regulations) and the airfreight exemption (section 292.5). Uncertificated carriers and freight forwarders, who admit frankly they lost their best friend on CAB when Chairman Landis left, are worried by the turn of events.

Talk Air-Mail Boost

Aviation spokesmen applauding House Rules Committee's refusal to clear omnibus legislation boosting the air mail postal rate from five to six cents for floor action are treading on thin ice. The committee's antagonism is directed not at the air mail boost but at other provisions of the bill raising the postal rate on third and fourth class matter. These affect newspapers and some politically potent editors and publishers have pressured the committee to pigeonhole the bill. Members of House Post Office Committee, however, are thinking about drawing up a single-purpose bill raising only air mail rates. Odds are that this would clear rules committee and be approved by the House. Sentiment has not yet crystallized in the Senate.

Fair Minded Commissioner

New York City and aviation interests everywhere can be thankful that in Police Commissioner Wallender they have an aviation enthusiast with experienced aeronautical judgment. Wallender came up through the ranks of the aviation section of the force and knows the problems of the pilot in the metropolitan areas as well as his associates know the traffic, homicide and other problems of the city. Last fortnight Wallender proved this point by successfully arguing down a city ordinance that would have clamped rigid restrictions on flying in the New York area, including helicopters. He stood firm for Civil Air Regulation part 60 as the basis for New York City ordinances and believes that only reckless flying should constitute the basis for city regulations, having in mind the significant precedent that a New York City ordinance would set throughout the nation.

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HEX-SOCKET SET SCREWS • SOCKET HEAD CAP SCREWS

NON-CORRODING "ALLENS" for applications where steel is subject to excessive moisture, chemical fumes or corrosive vapors. Made of "18-8 Type" *Stainless*, non-heat treated, non-magnetic. Set screws: stock sizes #6 to ½" diameter; cap screws: #8 to ½". N. C. threads only. Class 3 fit; Allen precision fastenings...Order of your local Allen Distributor, or write us for samples and literature.

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NEWS DIGEST

DOMESTIC

National Mediation Board last week was attempting to end the strike of National Airlines' clerical and station personnel. NAL President G. T. Baker said there had been no interruption in service during the first few days of the walkout.

Dr. Albert E. Lombard, Jr., formerly engineering consultant, has been named Director of Military Aircraft Sales for Consolidated Vultee Aircraft Corp. Lombard joined Convair in a consulting capacity in 1944 prior to which he was associate professor at California Institute of Technology.

Thomas K. Finletter, chairman of the President's Air Policy Commission, has accepted the post of chairman of the planning board for the International Air Exposition, scheduled for July 31 at Idlewild, New York's International Airport. President Truman has been invited to attend opening day ceremonies.

Civil Aeronautics Administration has extended until Aug. 31, 1948, the issuance closing date for limited airworthiness certificates applicable to surplus aircraft. Reason for the extension (from Jan. 31) was recent advancement to June 30, 1948, of War Assets Administration's surplus sales authority.

First all-weather fighter training project has been initiated by the Fourth Fighter Group at Andrews Field, Md., Strategic Air Command headquarters. Using Lockheed P-80 fighters, the group is maintaining five daily schedules between Andrews and Clinton County Air Field, Ohio, regardless of weather. An outgrowth of the All-Weather Air Line, the new project is designed to provide training prior to activation of special all-weather fighter aircraft, now under development.

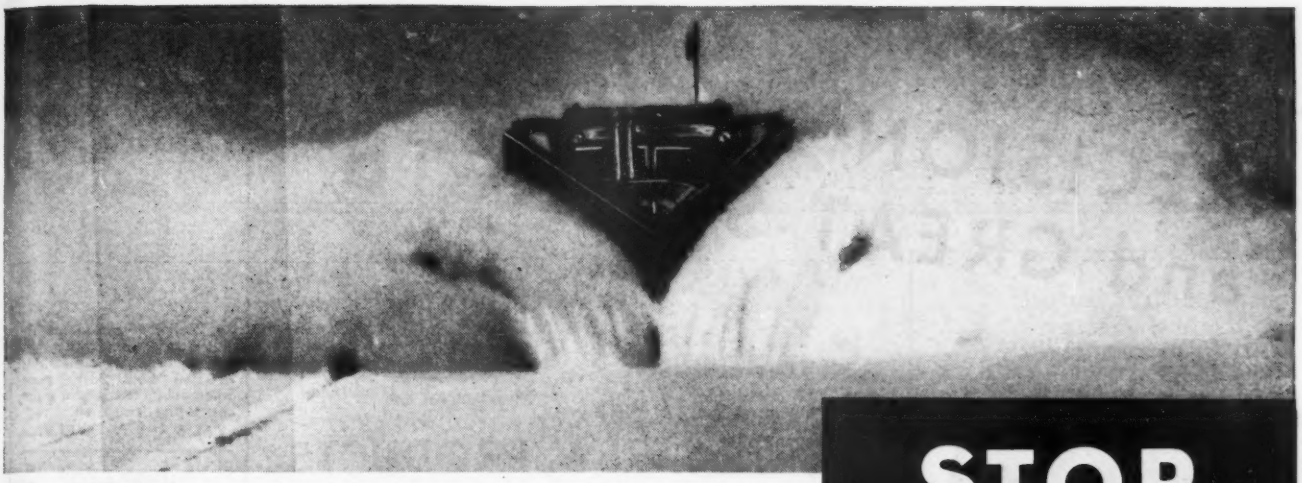
FINANCIAL

Securities and Exchange Commission has approved a three months' extension of the maturity of $1,100,000 in Northeast Airlines notes held by Atlas Corp. Under the extension, the notes will mature Mar. 31.

FOREIGN

British European Airways has announced it will reduce its staff as one step in a program to cut its deficit. In its first financial year the carrier lost more than $8,000,000.

Canadian and Bahamas governments have signed an agreement which will facilitate early establishment of Trans-Canada Air Lines' proposed service between the Dominion and the Colony.



STOP Those Winter Losses due to Snow-clogged Runways!

Compare your present method with this performance:

• A giant 250 hp. Walter Snow Fighter clears a 28 ft. path on its opening run —a 14 ft. width on succeeding runs— at 20 to 30 mph. Or, two 185 hp. models, in echelon, clear a total width of 29 ft. on each high-speed run. A 150 ft. width, on a mile long runway is cleared in 15 minutes—entire runway cleared in one hour. Snow is hurled far to the side, avoiding dangerous snow banks.

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You can do it with most powerful and effective of all snow-fighting equipment — Walter Snow Fighters. These specially designed units provide non-slip traction to operate at such high speeds and remove such a volume of snow, that you actually keep *ahead* of the blizzard.

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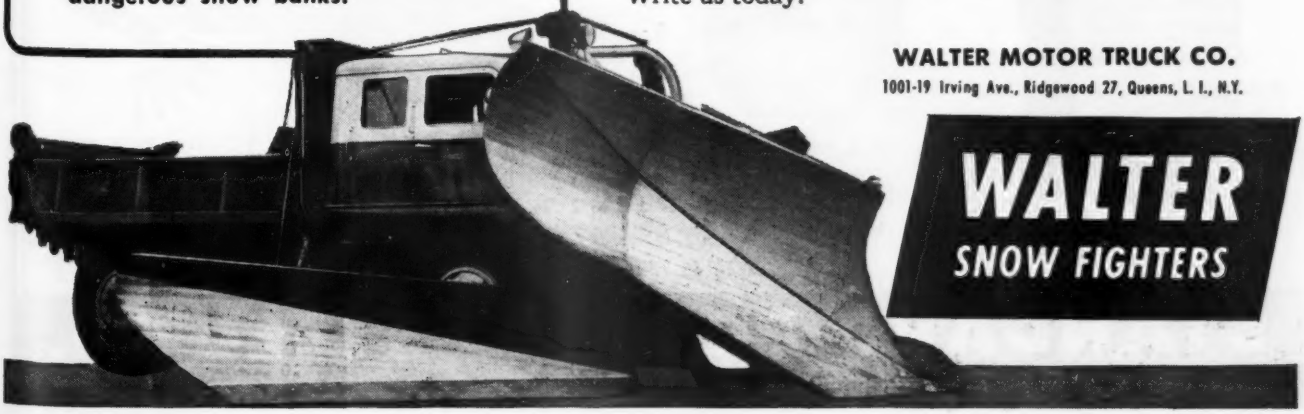

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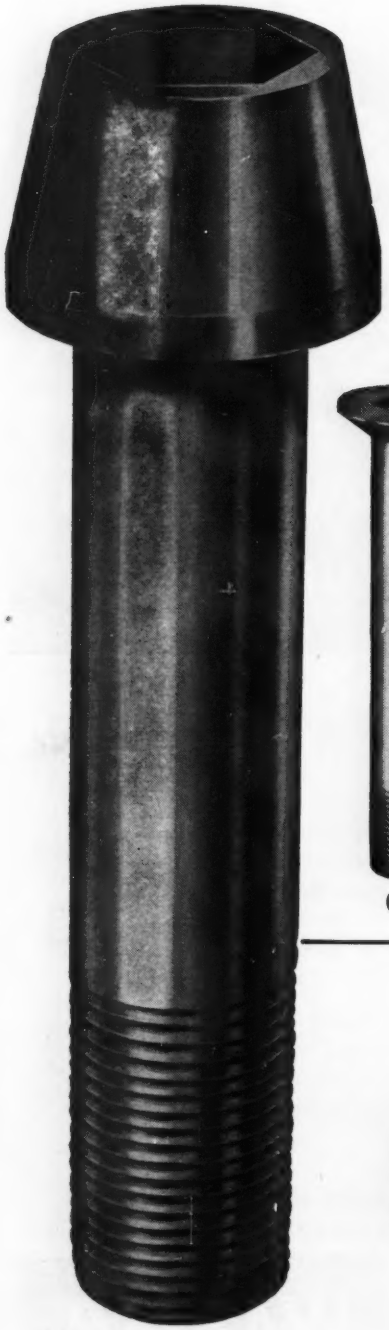

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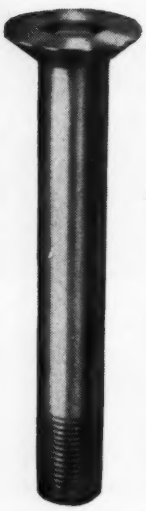

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And that's why—for security in the air—more and more "Unbrako" Socket Screw Products are being specified by aircraft designers and engineers.

The "Unbrako" Internal Wrenching Bolt (A); the 100° Flush Head Socket Bolt (B), and the Internal Wrenching Lock Nut (C)—an officially approved safety nut—meet the extreme degree of precision, tensile and other stringent requirements of the aviation industry.

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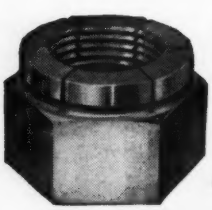

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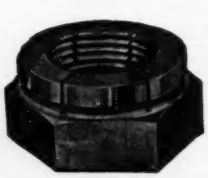

A Self-Locking, All-Metal, One-Piece Nut. Every thread, including the locking threads, takes a full share of the load. Available in sizes #6 to 2" in diameter—millions in use.

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The knurled threads make this screw a Self-Locker, too, for Flat, Cone, Oval, Half and Full Dog Points.
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The knurled head of this "Unbrako" provides a slip- and fumble-proof grip, though the fingers and head be ever so oily, therefore, it can be screwed-in faster and farther before it becomes necessary to use a wrench.

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Vol. 48, No. 5

AVIATION WEEK

Feb. 2, 1948

CAA Seeks $23,099,000 Fund For Radar, Approach Lights, ILS

Fate of airways program depends on reversal of Congressional attitude; military-civil agreement reached on high intensity lights; GCA also included.

Progress toward the goal of civilian all-weather flying this year will be measured largely by the fate of the Civil Aeronautics Administration's $23,099,000 request for new air navigation aids now before Congress. It was a Congressional slash of more than 30 percent in the appropriation for fiscal 1948 that virtually stymied modernization of the federal airways system.

Major items in the fiscal 1949 navigation and landing aids program currently include:

• **ILS**—Despite a Congressional rebuff on its VHF radio instrument landing system last year and a warning by Rep. Carl Hinshaw (R., Calif.) that he would oppose all further ILS expenditures, CAA's largest single item is $5,918,000 for some 46 new ILS installations and modifications of 63 systems already installed. Breakdown is $2,800,000 for 40 new installations in the United States; $691,000 for six ILS and distance measuring equipment installations in Alaska; $817,000 to change 65 ILS localizers from equi-signal to phase comparison; and $1,610,000 for duplicate emergency ILS transmitters at installations already in operation. There are now 57 ILS sets in commission.

• **High Intensity Lights**—CAA requested $2,370,000 for 39 single row high intensity approach light systems to be installed at major airports. With speedy action on this request it would be possible to have installations completed at a half dozen major air traffic centers before next winter's bad weather season. Many safety experts believe that this item offers the most promise for an immediate increase in the safety and regularity of marginal weather operations. CAA's request was backed by an agreement between military and civilian aviation representatives on the specifications for high intensity approach lights. However, military will use two rows paralleling each side of the runway while civil airports will have a single row on the left side of the runway according to the agreement.

• **Radar**—Total of 22 sets of precision beam (GCA) radar costing $2,970,000 and 21 sets of surveillance radar for traffic control costing $2,121,000 were requested.

• **Distance Measuring Equipment**—CAA asks $2,003,500 for 90 units of distance measuring equipment to be used with omni-ranges. Total of 597 DME units is planned for the omni-range system with 16 units provided for in the 1948 appropriation of the Administration.

• **Alaskan Airways**—Total of $3,035,420 is sought for improvement of Alaskan airways used by international airlines. Bulk of funds are for ILS and radar installations at six airports and living quarters for personnel in communications work.

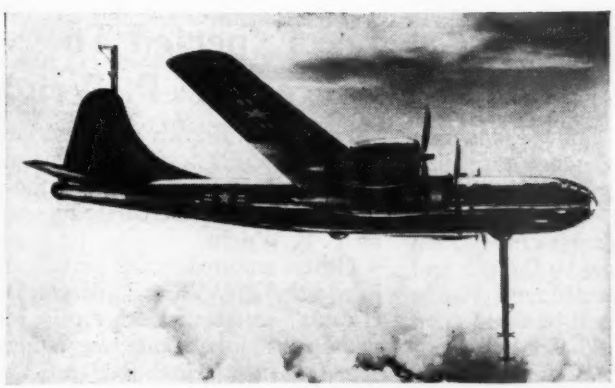
Labor Shift

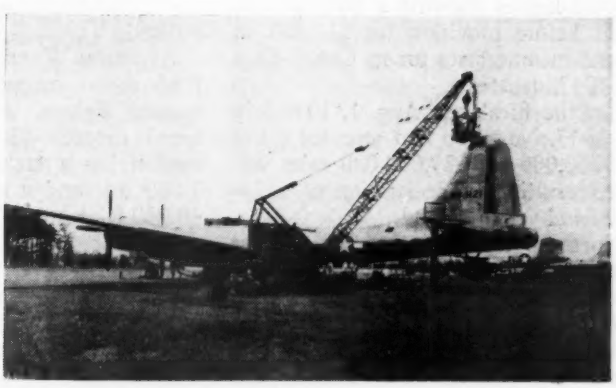
What is the labor turnover in aircraft and aircraft parts?

For October, the U. S. Bureau of Labor Statistics gives this answer:

In aircraft, for every 1,000 employed, there were 74 hired and 59 separated.

In aircraft parts (including engines), the ratio was 33 hired and 34 separated for every 1,000 employed.



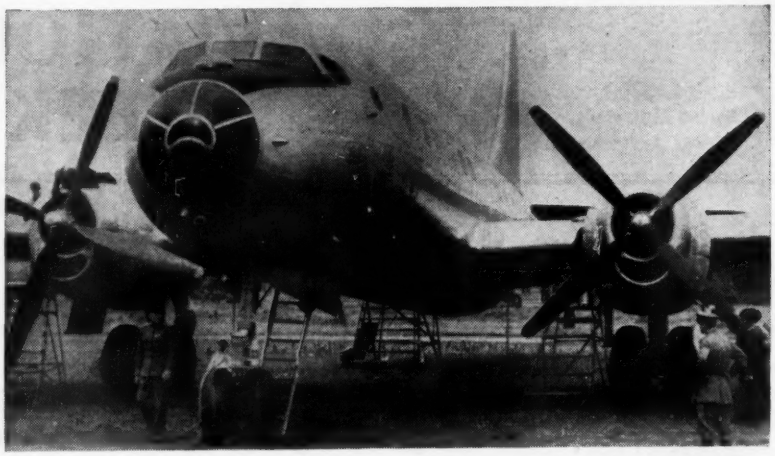


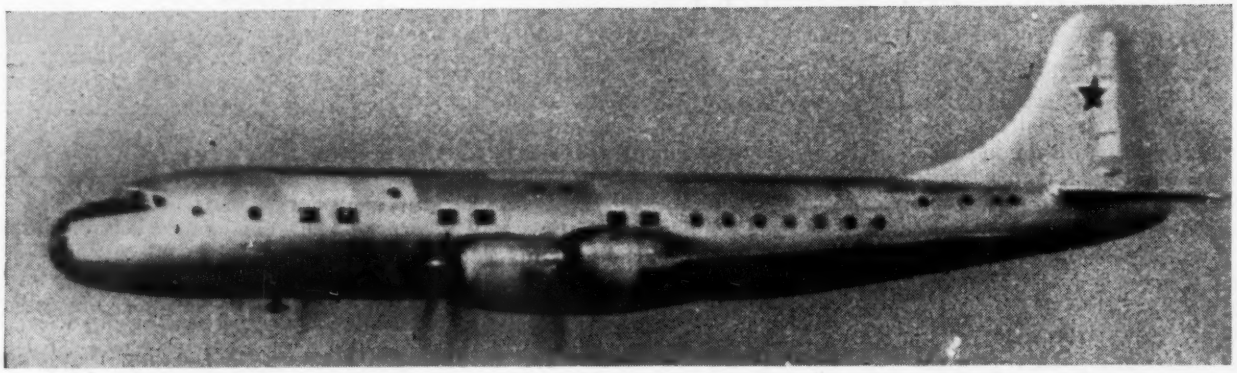
STRATOVISION NEARS FLIGHT TEST STAGE

Modification of a Boeing B-29 bomber as the airborne component of the Martin Stratovision system is nearing completion with flight tests scheduled shortly. Photo at left shows artist's conception of completed B-29 as it will appear during FM and Television program rebroadcasting operations. Huge 25-ft. antenna mast below nose telescopes up into fuselage. Photo at right shows installation of fin mast, used for receiving program from ground. About 5,000 lb. of special equipment, designed by Westinghouse Electric Corp. engineers, will be carried. Initial tests will be made over Baltimore transmitter.

RUSSIAN B-29 VERSION

First photographic evidence of Russian B-29 development shows the Tupolev TU-70 in flight and ground closeup. Allegedly designed by Andrei N. Tupolev, the striking resemblance to the Boeing B-29 Superfortress is clearly evident in the engine nacelles, wing panels, landing gear, nose inclosure, vertical stabilizer and general fuselage lines. Fuselage is 119 ft. long (20 ft. longer than B-29) and features "step" windshield, replacing smooth B-29 nose. Span remains 141 ft. 3 in. of Boeing B-29. Wing appears lower on fuselage. Only nose compartment, containing crew of five, is pressurized (as in B-29). Engines are patterned after Wright Duplex Cyclones and are built at Far Eastern Ural State Aircraft Factory. Craft is 70-passenger prototype for Russian airline use.





Northrop, North American Profit

First quarter reports for fiscal 1948 indicate both firms in black.

Northrop Aircraft Inc. and North American Aviation reported a profit for the first quarters of their 1948 fiscal year. Northrop had a net profit of $106,000 for its first quarter (Aug. 1-Oct. 31, 1947) and paid a 23½ cent dividend. North American reported unaudited figures showing a $39,011 net profit before provision for $15,500 in federal income taxes for its Oct. 1-Dec. 31, 1947, quarter.

For the fiscal year Aug. 1, 1946-July 31, 1947, Northrop had reported a net of $250,000 on $29,000,000 sales volume, resulting in declaration of a 25-cent fiscal year dividend.

Northrop sales for the first quarter just reported were $6,700,000 and a backlog of $19,00,0000 was recorded Oct. 31.

The quarter brought North American a new business gain of $70,699,204 which raised the backlog of unfilled orders to $269,148,114. During the first quarter of the preceding year the company showed a net loss of $216,784.

Due largely to activation of the B-45 jet bomber production line at Long Beach, North American employment rose from 16,330 at the start of the quarter to 18,522. Further gains in the employment total may be expected as the year progresses.

While the company gave no explanation of the $70,699,204 of new orders acquired during the fiscal quarter, it may be assumed that the amount covers at least a portion of a reported order for 224 P-86 swept wing jet fighters and an additional 44 B-45 jet bombers, bringing to 140 the total number of bombers ordered.

AVIATION WEEK is informed that the P-86 shows exceptional promise as a tactical fighter, and that maximum speed exceeds 650 mph. Production version has a tactical range exceeding 1,000 mi. and a service ceiling above 40,000 ft.

Convair losses already have been cited, and 1947 reports by Douglas and Lockheed are not expected until March.

Lockheed's report will be based upon 1947 production of 55 Constellations, 49 Navy P2V-1 and P2V-2, 259 P-80 A and B, and a conversion of 193 P-80-AN to P-80B design. Profits from delivery of these aircraft will be modified appreciably by major redesign of the P2V-2 and some 8000 changes in the Constellation. The bulk of the latter is involved in conversion of the Model 40 design to the "Gold Plate" models Nos. 649 and 749.

Extent to which supersonic research and guided missile projects will have influenced manufacturers' 1947 financial reports cannot be determined, in view of existing security restrictions, but it is reasonable to anticipate that gains in this field of development and production will be experienced throughout the current year. North American, for example, discloses that during the past fiscal year its aerophysics department grew from 170 to 500 employees.

Lee Expected To Succeed T. P. Wright

Fred Lee, Deputy CAA Administrator, last week appeared to have the best chance for succession to the Administrator post which is being vacated by T. P. Wright.

Others reported under consideration, in addition to William Anderson, Pennsylvania aeronautics director whose name was listed last week, include Joseph Marriott, Sixth Region CAA administrator, Santa Monica, Calif., and Leslie L. Schroeder, Minnesota aeronautics director.

► **Truman Tribute**—President Truman accepted Wright's resignation in a letter dated Jan. 24, paying tribute to his work:

"During the seven and a half years which you have spent in government service you have given unsparingly of your talents and time to help win the war and subsequently to develop a strong civil aviation industry. To war production activities you made a notable contribution and it was my pleasure to award you the Medal for Merit in token of your distinguished work in that field. In the direction of the development of civil aviation as Administrator of Civil Aeronautics you have continued to give outstanding service," the President's letter said.

Text of Administrator Wright's letter of resignation listed as reasons for leaving: "My urgent need to increase my income substantially above the salary Congress appropriates for the position; the apparent unlikelihood of promotion or advancement; the very fine outstanding offers I have received, one of which I intend to accept. This position will afford an opportunity for service in the field of education and research over a wide field of human endeavor. This broadening of outlook is attractive and to me important.

"I have mentioned the above in some detail as I believe my case is not unique but rather the rule with those in Government service in administrative positions who do not possess independent wealth. Possibly such an apparent prerequisite for continuing Government service is not consistent with a correct conception of our democratic ideals," the Administrator's letter continued.

▶ **New Wright Post**—The President's letter accepted Wright's suggestion that effective date of his resignation be "a couple of months hence."

Administrator Wright has accepted the position offered by Cornell University, as president of the Cornell Research Foundation and vice-president of the university. His principal responsibility will be to head the Cornell Aeronautical Research Laboratory at Buffalo, N. Y.

Aviation Maintenance Corp. To Produce Allison Radar

Aviation Maintenance Corp. will be production manufacturer of the lightweight Allison airborne radar, designed by Don Allison & Associates of Los Angeles.

Reagan C. Stunkel, AMC president, said, "Our plan is to produce this unit in quantities at a sales price that will be less than that of the standard radio communication equipment now carried in airliners."

An experimental prototype installed in a Southwest Airways DC-3 last fall weighed less than 70 lb.

Awarded honors by the Institute of the Aeronautical Sciences (left to right): Tice, Schubauer, Gaylor, Clousing, Holzman, Skramstad.

Guggenheim Medal To Lester Gardner

Award one of several at IAS meeting; Finletter discusses foreign air policy.

Lester D. Gardner, who conceived and organized the Institute of Aeronautical Sciences, received the Daniel Guggenheim medal at the IAS 16th annual Honors Night Dinner last week as the organization met four days in New York.

Gardner

Principal speaker was Thomas K. Finletter, who elaborated on key aspects of the recent report by the President's Air Policy Commission, of which he was chairman.

▶ **Outstanding Achievement**—The award to Major Gardner—presented on behalf of the Institute, the American Society of Mechanical Engineers, Society of Automotive Engineers, and United Engineering Trustees, Inc., by T. P. Wright, retiring head of the Civil Aeronautics Administration—was bestowed for outstanding achievements in advancing aeronautics, particularly the founding of the Institute.

Gardner was Chairman of the Council and president of the Archives of IAS when he retired last year. The medal was awarded last June but the presentation was not made until last week. Actually it was SAE's turn to present the honor, but because of Major Gardner's part in affairs of IAS, the occasion was planned to coincide with the Honors Night dinner.

Recipient of many other honors for his interest and achievements in aeronautics, Major Gardner also was founder of AVIATION magazine, oldest aeronautical publication in the United States, now a part of AVIATION WEEK.

▶ **Other Awards**—In addition to the honorary fellowship to Lt. Gen. James H. Doolittle, retired, and other awards at the dinner (AVIATION WEEK, Jan. 26), ten men were given IAS fellowships.

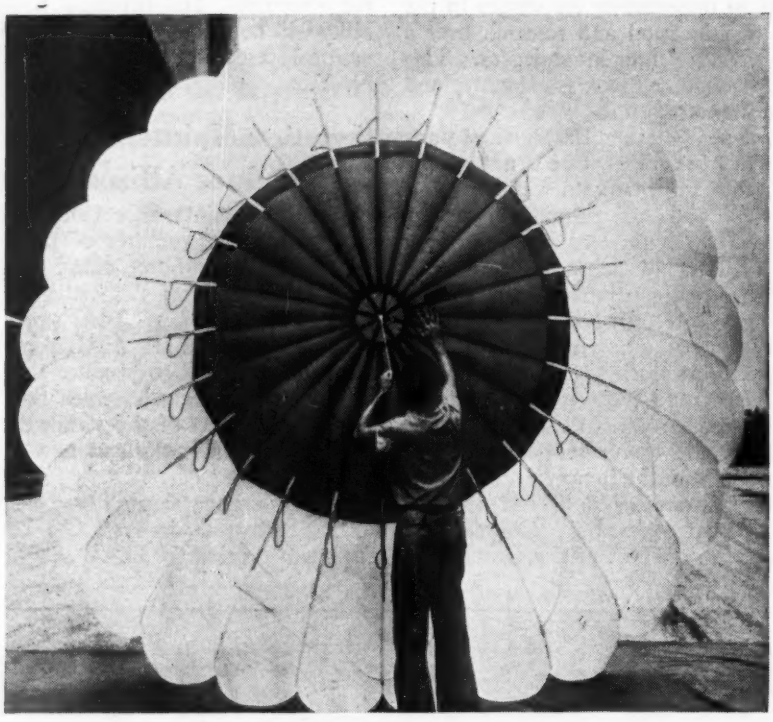
The gathering heard Mr. Finletter, speaking on "Foreign Policy for the Air Age," discuss the relationship of Commission recommendations to the broad foreign policy of the U. S.

Like previous sessions, last week's meeting was taken up largely by technical papers, some of which are summarized elsewhere in this issue (see page 18). More detailed reports will follow in subsequent issues of AVIATION WEEK.

▶ **Transport Symposium**—One of the important early portions of this meeting was an air transport symposium to discuss, among other things, method for bolstering the present inadequate system of air traffic control.

Keyed with analysis of traffic problems were recommended solutions offered in coordinated papers on "Air Traffic Control," by Sir Robert Watson-Watt, scientific adviser on telecommunications, Air Ministry, Great Britain; "Operational Procedure," by Capt. A. S. Born, USN, Office of Chief of Naval Operations; "Technical Problems," by Vernon I. Weihe, Air Transport Association of America; and "Specific Method of Implementation," by Nathan Braverman, assistant chief engineer, Communication and Navigation Laboratory, Wright Field.

Need was cited for the immediate development of an integrated electronic system which would serve all aircraft. Many of the operational and technical experts in the field of air navigation and traffic control believe that an evolutionary system that utilizes ground radar interrogation of air-borne transponders, with an associated private-line communication system, can form the basis upon which an adequate control system can be evolved.



NAVY DEVELOPS NEW CHUTE

A parachute that allows a top panel canopy to open and spill air when jumps are made at speeds up to 500 mph. has been developed by the parachute experimental unit of Lakehurst, N. J., Naval Air Station. As the jumper's speed decreases, elastic cords attached to the "cap" pull it back into place. Thus far, experiments with the chute have been limited to dummy bombs. (Press Assn.)

Engines Blamed in Syrian Crash

Senate investigators' report urges more frequent overhaul for airline safety.

Failure to change an engine after it exhibited numerous symptoms of malfunctioning was blamed for the crash of a Pan American World Airways Constellation in the Syrian desert last June 19, by Caro Dolan, special technical consultant to the Senate Interstate and Foreign Commerce Committee. Seven passengers and seven crew members were killed.

Dolan's report claimed that the Constellation's No. 2 engine was defective from the start of the flight from New York and had it been replaced at Gander, Newfoundland, the accident might have been averted. Between New York and Gander the No. 2 engine had to be feathered due to a marked drop in brake mean effective pressure. Spark plugs were changed on a cylinder at Gander but the plane was forced to return to Gander due to similar symptoms in the No. 2 engine. This time a complete cylinder was changed and found to have suffered a top piston ring failure.

▶ **Hydraulic Change**—On arrival in Rome a new hydraulic pump was installed because of a leaking oil seal on the same engine. At Istanbul this engine was reading 15 BMEP low at rated power settings. Left magneto breaker points were found closed and had to be opened.

At Karachi, the turnaround point, a service check was made and the flight took off for Cairo after the crew rested 16 hours. About 80 miles northeast of Adaban the No. 1 engine failed at 18,500 ft. due to a broken exhaust rocker arm on No. 18 cylinder. The propeller was feathered. Three hours later No. 2 engine caught fire due to a main thrust bearing failure. It fell out of the plane pulling fuel lines with it, just before the Constellation made an emergency landing near Mayadine, Syria.

▶ **ICAO Criticized**—Dolan also criticized the State Department and Civil Aeronautics Administration and ICAO for contributing funds for upkeep of certain foreign weather forecasts without demanding more efficient service. He pointed out that the Ankara, Turkey, forecast furnished this flight was 24 to 30 hours old. Other Dolan recommendations included:

• **Use of methyl bromide** as an engine fire extinguisher instead of carbon dioxide.

• **Overhaul of Constellation** engines every 500 hours until major bugs are eliminated. Two of the four engines on the ill-fated plane had more than 600 hours since their last overhaul.

• **Escape hatches** should be provided to facilitate emergency exit regardless of the condition or position of the plane.

Other accident reports included: CAB verdicts on two Slick Airways C-46 cargo plane crashes and a National Fire Protection Association blast at airport fire fighting equipment and the use of integral wing tanks in the fire following Jan. 21 landing of an Eastern Airlines Constellation on a snowbank lined runway at Boston.

▶ **ILS Landing**—The Constellation made an ILS landing at Boston and struck a snowbank on the left side of the runway. Impact collapsed the right gear and put a severe strain on the right wing where fire developed quickly around an engine. Fuel pouring from the ruptured integral wing tanks was ignited and the aircraft almost completely destroyed. None of the 25 passengers and crew was seriously injured.

Slick C-46 crash at Denver on Feb. 14, 1947, while making a practice ILS approach at night was blamed on loss of control or overcontrol by the pilot and failure of the co-pilot to remain alert during the approach. CAB report said the ILS had a slight dip but was not hazardous. Both pilot and co-pilot were killed and the plane demolished when it hit a 218 ft. hill 3,230 ft. short of the runway.

SEC Report Indicates Aviation Security Upswing

A definite improvement in sentiment by aviation officials toward their own securities is evident in the summary of security transactions for November, 1947, released recently by the Securities and Exchange Commission.

While a number of outstanding sales were recorded, the purchases of aviation shares were far more significant.

L. S. Rockefeller acquired an additional 5000 shares of Eastern Air Lines, bringing his total holdings up to 50,000. E. M. Queeny also bought an additional 1000 shares of American Airlines common to boost his holdings to 15,000 shares in that equity. D. C. Frawley purchased 300 shares of Capital Airlines common stock, bringing his total ownership up to 1020 shares.

In contrast, Sherman M. Fairchild continues a persistent seller of Pan American Airways, liquidating 3000 shares of that company and reducing his holdings to 17,700 shares.

Also on the selling side, Sigmund Janas sold 5800 shares of Colonial Airlines, bringing his holdings down to 25,438 shares.

INDUSTRY OBSERVER

▶First "NX" Convair-Liner arrived at American Airlines' Ardmore, Okla., base late last month, and crew training was slated to start immediately. Delivery of two more ships is expected shortly.

▶Contracts for reconditioning 150 twin-engine Curtis Comandos purchased by the Chinese government have been received by Slick Airways and Grand Central Airport Co., Glendale, Calif. The planes, bought from the War Assets Administration for $5,000 each, will be used by the Chinese Air Force. Grand Central will recondition 100 of the C-46s (all of the A and D series) and Slick will modify 50.

▶Consolidated Vultee's XC-99 military transport and cargo plane, the world's largest land-base plane, made its third flight in San Diego, Jan. 22. Lasting three hours and 10 minutes, the flight was made at a gross weight of 245,000 pounds, an increase of 15,000 pounds over the weight carried on its second flight. The big plane carried a load of 11,590 gallons of fuel, 1176 gallons of oil, and 12,775 gallons of water as ballast. Crew of 13 tested the plane for air speed calibration and general handling characteristics at the increased gross weight.

▶West Coast engineers have preliminary sketches ready to show airlines how existing big transports might be modified to adopt turbo-prop power units. Britain's "Python" turbo-prop unit is a favorite drafting board model. Sudden emergence of a Stratocruiser, DC-6, Constellation, or Constitution with turbo power is unlikely. Airlines are too poor to finance it. Such conversion would require more than a simple exchange of powerplants in current airframes. While some four-engine transports aerodynamically could accept the higher speeds of turbo-prop operation, they would have to be rebuilt at great cost to strengthen their structures for high-speed stresses. A transport in the 175-200,000 lbs. weight range might have to have as much as 20,000 lbs. of structural "beef-up" added to permit operation at 375 mph. which is the minimum cruising speed at which a turbo-prop installation would begin to pay off in operating economies. Sketches of turbo transports are "window dressing," impractical but sound in their purpose of reminding airline customers that as soon as they can show the color of their greenbacks the manufacturers will start building jet transports.

▶How closely speculation can be keyed to actual developments is difficult to say, but some aerophysicists on the West Coast are wondering if the long-discussed orbital rocket, fired into outer space at such speed that it will balance against earth's gravity pull and become a satellite, may be achieved by a three-stage rocket in the course of V-2 tests at White Sands. Sketch pad doodles portray a V-2 serving as a massive booster rocket for a powerful, slender sounding rocket based in the V-2 nose cone. When the V-2 has reached maximum speed a secondary booster rocket will kick the sounding rocket on upward as the latter's engine starts firing.

▶Gloster Aircraft Co. is working on a new jet fighter powered by a Rolls Royce Nene jet engine. Second version of the Armstrong-Whitworth AW-52 jet flying wing will be powered by Rolls Royce Derwent engines instead of Nenes. Slimmer Derwents can be buried completely in the wing to reduce drag.

▶Army Ground Forces has approved the L-17A Navion and requested additional quantities for Air Force procurement during fiscal 1949 and 1950. Air Force, which procures AGF aircraft, has already ordered an additional 50 Navions from Ryan Aeronautical Corp. for immediate delivery, bringing to 133 the total already procured. Total purchase of Aeronca L-16A liaison planes has reached 613, of which 132 remain undelivered to the AGF. National Guard has received 376 L-16A and 47 L-17A.

▶University of Illinois has received an Office of Naval Research contract for a study of fuel mixing in turbojet, ramjet and rocket engines at supersonic velocities. A fluid mixing laboratory, containing a compressor producing 500 cu. ft. of free air per min. at a pressure of 100 PSI, is now nearing completion. The project is under the direction of Dr. L. G. Alexander.

▶North American Aviation has started deliveries on B-54A four-jet bombers on an Air Force contract for 100 of the type. First production models are being flight delivered from their Long Beach assembly plant to Muroc Air Force Base for preliminary flights. B-45 is slated for assignment to Tactical Air Command units with headquarters at Langley Field, Va.

AVIATION CALENDAR

Feb. 5—American Legion national aeronautical conference, Wright Field.

Feb. 6-7—American Legion national areonautical conference, Indianapolis.

Feb. 13—Air Transport Command reunion, Waldorf Astoria, New York.

Feb. 16-17—Second annual Purdue Airport and Fixed Base Conference, Purdue University, West Lafayette, Ind.

Feb. 17-19—ATA meterological committee, Peabody Hotel, Memphis.

Feb. 26-27—Louisiana Aviation Conference, Shreveport.

Mar. 8—ICAO maps and charts division, Brussels.

Mar. 18-19—California State Aviation Conference, Hollywood Roosevelt Hotel, Hollywood.

Mar. 19—National flight propulsion meeting, Institute of the Aeronautical Sciences, Cleveland.

Mar. 22—ICAO aeronautical maps and charts division, Brussels.

Mar. 28-31—Annual conference, Society of the Plastics Industry, Santa Barbara, Calif.

Mar. 30—ICAO personnel licensing division, Montreal.

Mar. 30-Apr. 1—Air Transport Association engineering and maintenance conference, Continental Hotel, Kansas City.

Apr. 1-3—American Institute of Electrical Engineers, Des Moines.

Apr. 4-8—American Association of Airport Executives, Congress Hotel, Chicago.

Apr. 20—ICAO rules of the air and air traffic control division, Montreal.

Apr. 24—Dedication of Skyway 1 and 11 and dedication of CAA aeronautical center, Oklahoma City.

Apr. 27—ICAO facilitation division, Europe.

Apr. 28-30—American Institute of Electrical Engineers, northeastern district meeting, New Haven, Conn.

June 1—ICAO second assembly, Palais Des National, Geneva, Switzerland.

June 14-15—Airlines Medical Directors Association, annual meeting, Royal York Hotel, Toronto.

June 15-17—Airport management conference, College Station, Tex.

June 16-18—19th annual meeting, Aero Medical Association, Royal York Hotel, Toronto.

June 21—American Society for Testing Materials, annual meeting and exhibit, Detroit.

June 21-25—American Institute of Electrical Engineers, summer general meeting, Mexico City.

July—International Air Exposition, Idlewild Airport, New York.

July 15—Ninth annual meeting, Airline Advisory Board, Kansas City, Mo.

July 31—International Air Exposition, Idlewild Airport, New York.

Aug. 24-27—American Institute of Electrical Engineers, Pacific general meeting, Spokane, Wash.

Sept. 2—International Aeronautic Federation, Cleveland.

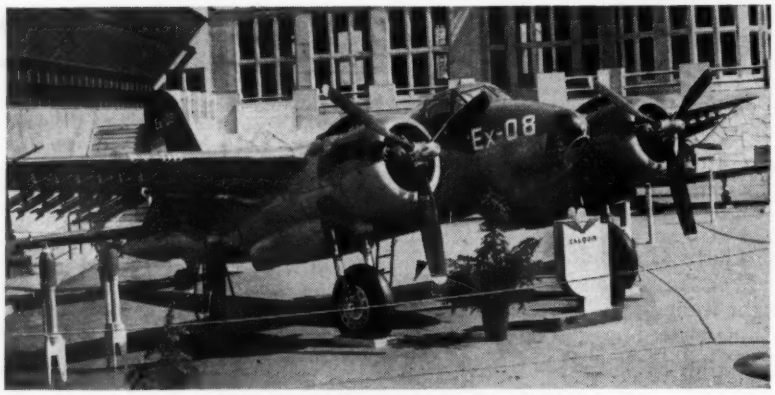
Sept. 4-6—National Air Races, Cleveland.

Sept. 8—ICAO operations division, Montreal.

Sept. 13-17—Annual conference and exhibit, Instrument Society of America, Convention Hall, Philadelphia.

Sept. 21—ICAO airworthiness division, Montreal.

Oct. 5-7—American Institute of Electrical Engineers, middle eastern district meeting, Washington.



ARGENTINE MOSQUITO

Twin-engine "Calquin" is native Argentine design powered by two Pratt & Whitney engines. A light bomber, it carries machine guns and a variety of aircraft rockets. About 250 are being manufactured by the Instituto Aeronautico at Cordoba, official Argentine government aircraft factory. (McGraw-Hill World News photo)

Congress Readies New Procurement Laws

Congressional approval of omnibus legislation, codifying and modernizing procurement law and regulations of the Army, Navy, and Air Force, appeared imminent. The House-approved measure was passed by the Senate and turned over to a joint conference committee.

Conferees are expected to accept Senate changes adjusting the legislation to the present national defense set-up. The House passed the bill prior to the unification of the services. Another Senate change, requiring cost-plus-fixed-fee contractors to give advance notification of any subcontract in excess of $25,000 or five percent of the contract, and authorizing the procuring agency to investigate the books of such subcontractors, is also expected to be approved without controversy. This amendment, it was pointed out by Chairman Chan Gurney (R., S. D.) of the Senate Armed Services Committee, is designed to prevent re-occurrences of "the Gen. Meyers case," in which the former deputy procurement chief at Wright Field allegedly was responsible for the funneling of aviation subcontracts into Aviation Electric Co., an Ohio firm which he owned, according to charges.

▶ **Competitive Policy**—While laying down a policy of competitive bid contracts, with awards going to the lowest bidder, the legislation gives legal sanction to negotiated contracts, under specified circumstances, by the Army, Navy and Air Force. These are, as follows:

- **During a national emergency,** if public exigency will not permit delay incident to advertising for competitive bids on contracts.
- **If aggregate amount of a** contract does not exceed $1,000, **or if a** contract is for personal or for professional services.
- **On contracts with educational** institutions for training **personnel.**
- **On contracts for experimental,** developmental, or research work or supplies for such work. Department secretaries would be required to file reports with Congress at six month intervals listing and describing the terms and nature of all research and developmental contracts negotiated.
- **Contracts for materials** including aircraft, parts, instruments, and accessories, the nature of which, for national security reasons, should not be publicized.
- **Contracts for standardized technical** equipment, which, in order to assure the interchangeability of parts with equipment that has already been procured, must be purchased from the same producers.
- **Contracts for supplies** of a technical or specialized nature—such as aircraft, requiring a large initial investment and an extended period of preparation for manufacture, on which an award to a new producer would involve a duplication of preparatory effort that has already been made.
- **If and when** an agency head determines that competitive contract bids have not been independently arrived at and that a preferable arrangement could be made through negotiation. Senate Armed Services Committee proposed that this stipulation would break collusive bidding, follow-the-leader pricing, rotated low bids, identical bids requiring drawing of lots, uniform estimating systems, and refusal to classify the government as other than a retail buyer.
- **If it is determined** to be in the national defense interest that any plant be kept in production.

The legislation also authorizes free delegation of procurement authority to promote cooperative procurement by the services. It requires that all competitive bids evidencing collusive action on the part of the bidders be turned over to the Attorney General for appropriate action under anti-trust law, and that standards and procedures for competitive bid procurement be written out.

State Airlines Requests Piedmont Service Delay

State Airlines, Charlotte, N. C., has petitioned CAB to stay the effectiveness of the feeder certificate issued Dec. 12 to Piedmont Aviation, Winston-Salem, N. C., or to order a delay in Piedmont's inauguration of service pending judicial review of the Board's decision in the Southeastern States case last April.

An unsuccessful applicant for the routes awarded Piedmont, State Airlines recently filed its second request for review with the U. S. Court of Appeals for the District of Columbia after CAB denied a petition for reconsideration of the Southeastern decision (AVIATION WEEK, Dec. 22). State contends Piedmont was illegally awarded routes it had not applied for but which State had requested. Piedmont intends to start service this month.

RECEIVES MEDAL

Grover C. Loening, areonautical engineer, received the President's Medal of Merit from Gen. Carl Spaatz, U. S. Air Force chief of staff, with a citation for Loening's World War II "outstanding service" as aircraft adviser to the WPB chairman, and as helicopter chairman for NACA. Loening is chairman of the board of Roosevelt Field, and known both for his long experience as engineering designer and as manufacturer of the Loening amphibian. (Air Force Photo)

Air Force Industrial Mobilization Now Moves Into Second Phase

Military program under way pointed at production problems airframe and engine contractors may face in event of all-out war production.

"Operation Skypower," the Air Forces' industrial mobilization program launched last year, has moved into phase two. This means that the military has achieved a start toward solution of the bottleneck problems which would confront the airframe and engine prime contractors in the event of all-out war production.

The Air Force in June will begin compilation of an industrywide study, on the prime contractor level, of the production and material resources needed to initiate and maintain a smooth flow of finished airplanes from the industry's plants.

▶**Studies Now Under Way**—Studies of plant and material resources needed by individual airframe manufacturers to achieve (starting M-day) the production goal given them by the military high command are now under way by most of the major plane builders who are due in Washington June 1. Contracts for these studies were let by the military last year.

Meanwhile, the Air Force is putting the final touches to plans for a phase two resources study for and by the Automobile Manufacturers Association. Talks with the auto manufacturers were initiated last year and have progressed almost to the contract stage. The object is to find out what the AMA can do to augment the production of aircraft engines.

Final talks between the Air Force and AMA hinge on reports by the aircraft engine manufacturers, due in shortly, on what their capacity is and could be. When this initial answer comes in, the auto people will be asked what they could do to raise the output of airplane engines to the strategic target set by the high command. They will be asked to report on the resources needed to allow sufficient plant conversion to bring up total engine production to the target figure.

▶**Covers All Facilities**—The resource studies by the airframe industry concern all facilities needed to turn out finished airplanes. They cover plant and equipment (including tools), basic and semi-fabricated materials, manpower (both skilled and technical), and other tangent facilities such as power and transportation.

As a basis for the reports, each plant has been given hypothetical target production figures. Each report will show what present capacity is and what it could readily be expanded to under the production goal—if the firm were supplied with the necessary resources such as tools, raw materials, and manpower.

These reports, when summed up by the Air Forces' industrial mobilization sections, will show how close to a hypothetical goal the industry's present and potential production facilities could reach. The over-all survey will also indicate what the production bottlenecks comprise.

Two other facets of the mobilization program, machine tool stockpiling and education of Air Force personnel in problems and techniques of industry, are being worked out.

At present the Air Force has a goal of 47,000 machine tools for a standby stockpile. This constitutes roughly half of the requirements of the joint Army-Navy machine tool program (92,000 tools). JANMAT has achieved about 30 percent of its goal. The tools are being procured from surplus war plants and properties held by War Assets Administration.

▶**Training in High Gear**—The training in industry program, initiated by the entire military establishment recently, is going into full stride. Military personnel are enrolled in 80 colleges and universities, 60 industrial schools, and, in personnel work alone, in 41 industries. Under the program, selected young officers and key enlisted personnel are sent to technical schools for one or two years, then into various industries for another term of study. After the tour of duty in schools and plants, the students serve for a time with the procurement sections of their particular branch of service. At the end of the program the graduates return to the regular military tour of duty. They constitute a backlog of personnel who would expand the procurement sections of the various arms and services on M-day, and they will have a basic understanding of industry's problems.

The Air Force, unlike some of the other services, has done little to bring its procurement problems before industry as a whole. Officials concerned with industrial mobilization give two reasons for this. First, they do not want to get below their prime contractor procurement level (airplanes and engines) until there has been an inventory of the over-all industrial potential by the Munitions Board and a "divvy" of the production pie made by the National Security Resources Board. Second, they do not have enough money to contract for resources reports by sub-contractors and other suppliers outside the airframe industry.

There is a current strategic mobilization plan. It is a target operation through which the military planners hope to know enough about the production bottlenecks—at the outset of the next unpleasantness—to achieve planned output in just half the time it took us in World War II. The plan, which is a continuous proposition rather than a one-shot affair, points to peak production of aircraft in one and one-half years after M-day.

Plastics Manufacturers See Easing of Shortage

Forecast by the Plastic Materials Manufacturers Association indicates that 1948 will be the first postwar year in which supplies of all major plastics materials will nearly meet the demand for them.

Plant facilities projected and announced during 1945 and 1946 have now for the most part been brought into production (or will have been by mid-1948). Cost of these plants has exceeded estimates by 30 to 40 percent, and delays in completion have ranged from six months to a year beyond original dates.

Most critical supply problem facing the thermosetting material manufacturers is that of formaldehyde although current supplies of phenol and urea are not much better. Government reports indicate that production of the needed raw materials has reached very high levels and producers state the supply-demand ratio is rapidly approaching balance.

Generally the thermoplastics are expected to be available in sufficient quantities to meet requirements. Certain types may be in short supply early in the year, but this should be overcome during the second quarter.

Aeronautical Progress Disclosed At 16th IAS Technical Sessions

Papers cover new investigations in rotary wings, instruments, flight propulsion, air transport, meteorology, aircraft design, and aerodynamics.

Engineering problems confronting aviation experts in the various categories were highlighted in a series of analyses presented at the technical sessions of the Sixteenth Annual Meeting of The Institute of the Aeronautical Sciences held in New York beginning Jan. 26, and running over to Jan. 29, 1948.

Presented at the meeting's initial session, concerned with studies in the rotary wing field, was **"Chordwise and Beamwise Natural Frequencies of Rotor Blades,"** by **Gabriel Horvay of General Electric's Engineering General Div.** Dealing with cases represented as not studied previously, this paper, posed the problem of determining natural frequencies of hinged copter blades to insure safe operation, detailed improved calculating techniques for vibrations in the plane of rotation, to afford prediction of blade natural frequency.

Stressing the advantages of a simple device to bring nearer increased use of personal 'copter craft, **"The Helicopter Control Rotor,"** by **Joseph Stuart III, project engineer, United Helicopters, Inc.,** covered design requirements of a new system to produce a smooth control stick and easily flyable craft. Described were details of the control—the dual overhead sticks and aerodynamic servo (control rotor) to damp out oscillations.

Other vital rotorcraft engineering phases were analyzed in **"Testing of Rotors for Fatigue Life,"** by **Jonathan Wilson, Prewitt Aircraft Co.'s consultant;** and **"Reduction of Vibration,"** by **Walter Gerstenberger, United Aircraft's Sikorsky Div. chief vibration engineer.**

Heading the Instruments Session was **"A Pneumatic Method for Measuring High Gas Temperatures,"** by **D. W. Moore, engineer in charge, Fairchild Camera & Instrument Corp.** Proceeding on the theory that measurement of temperature in turbojet, rocket, ramjet, and other thermodynamic power plants is a vital consideration in securing efficient engine operation and assuring safety of engine and airframe, the paper described a method seen as extremely dependable and applicable to large gas turbines presently under development.

"Flight Path Control," by **P. A. Noxon, senior engineer in charge of automatic pilots, Eclipse-Pioneer Div., Bendix Aviation Corp.,** discussed factors involved in designing a practical automatic system for air navigation by radio, including stability, airborne antenna location, operating procedures, limitations caused by passenger comfort considerations, etc. Commercially available equipment with current radio systems were seen as providing substantial improvement in airline schedules.

In **"Machmeters for High-Speed Flight Research,"** by **Herbert Schaefer, project engineer, Kollsman Instrument Div., Square D Co.,** various types of this instrument were described, and design details of the intricate and newly developed transonic Machmeter were given. Design of transonic and supersonic Mach devices were considered in the light of particular difficulties encountered because of very high differential pressures at supersonic airspeeds.

Describing a method whereby limitations on earlier methods of evaluating airplane system dynamics can be successfully overcome, **"Application of the Performance Operator to Aircraft Automatic Control,"** by **R. C. Seamans, Jr., director, tracking Control Project, M.I.T. B. G. Bromberg, McDonnell Aircraft Corp.,** and **L. E. Payne** of **Jackson & Moreland,** presented a procedure which permits not only the system parameters but also those of components parts to be readily obtained, so that dynamic response characteristics can be determined for an existing design, for a modification, or for a system in the design state. Used was a mathematical concept developed by Draper, called The Performance Operator, expressing relationship between system output and the forcing function responsible for the output.

In the Flight Propulsion Session, **"Problems of Gas-Turbine Propeller Combinations,"** by **Frank W. Davis, Convair's assistant chief engineer,** outlined initial flight testing of the General Electric TG-100, and discussed many problems encountered which must still be solved as turboprop development continues—starting, control, feathering, vibration, and others. Studies were described as indicating that conventional satisfactory for use with gas turbines; that constant speed props and governors are not new methods of propeller control, such as by torque rather than rpm. are needed; new standards of prop balancing are required; and that improvement in temperature control, starting, and service life are particularly necessary.

Completing the Flight Propulsion session were papers **"Application of Gas Turbines of Aircraft,"** by **Arthur N. Tifford, of Westinghouse's Aviation Gas Turbine Div.; "Method for Handling the Performance of a Propeller and Its Match to a Powerplant,"** by **J. P. Grandfield, E. T. Jansen,** and **J. L. Cooley, Research Department, United Aircraft Corp.;** and **"NACA Investigation of Gas-Turbine Blade Cooling,"** by **H. Ellerbrock, Flight Propulsion Research Lab., NACA.**

Leading off in the Air Transport session was **"The Automatic C-54,"** by **James Anast, All-Weather Flying Div., Air Material Command,** which carried the prediction that in the next few years, the use of automatic control of aircraft will demonstrate superiority over manual control by increase in margins of safety and the operation under blind flying conditions. Stressing the fact that with modern aircraft, even the most skilled pilot is severely taxed, probably to such an extent that the margin of safety over human failure is dangerously small under blind flying conditions, the paper explained that a prototype automatic flight controller, accomplishing elementary automatic flight, has been built to reduce pilot's responsibility for detailed aircraft control, and that successful trans-ocean and transcontinent flights have been made with this equipment. The instrument was described as affording a means for progressive evaluation of newly developed systems in an integraded form.

"Research Toward Greater Airline Passenger Comfort," by **K. R. Jackman, Convair's chief test engineer** described the important problems of aircraft noise reduction and comfortable seating. Described was how Convair has found that acoustical comparison of numerous new cabin lining and trim materials, on the ground, will save much expensive flight time and yet can be correlated with noise levels measured aloft. Also analyzed were acoustical contrast between soft and hard (plastic) interior trims, between additional layers of Fiberglas and its equivalent weight to mica skin dampening, and between Fiberglas blankets of various fiber sizes. Additional description covered the current lightweight Convair double passenger seat and, and such test aids as " dynamic cycler" to accelerate life tests on seats and cushions, the "Single and Multiple Indentors" for spring-rate determination and the "Vibrindex" and "Ridometer" in ride characteristic identification.

Results achieved in three years of lab research on Mt. Washington to obtain data on best preflight evaluation of experimental deicers and to provide a station where all theories of ice formation and its removal could be accurately checked, was discussed in **"A study of Wing De-Icer Performance on Mount Washington,** by **D. L. Loughborough, H. E. Greene,** and **P. A. Roush,** of **B. F. Goodrich Co.'s Physical Research Laboratory.**

In the Meterology Session, **"Electric Field Intensity Inside of Natural Clouds,"** by **Ross Gunn, director of physical research, U. S. Weather Bureau,** was represented as bringing together for the first time reliable statistical data on actual magnitudes on electric fields measured inside thunder clouds and ordinary clouds. Electric fields up to 1,500v./cm. were stated as being extremely common inside actual thunder clouds—about half the field actually measured in flight when the investigating airplane was struck by an active bolt of lightning. Results show that the field, hence the hazard, is greater just inside the cloud than just outside at substantially the same point, and that the electric field and probability of a lightning strike are maximum within the cloud, near the freezing level. Other measurements show that fields in ordinary clouds never exceed 10v./cm. unless convective activity within the cloud is present.

Three other papers at this session were interrelated—**"Preliminary Results of Detailed Studies of Thunderstorms,"** by **Horace R. Byers; "Structure and Dynamics of the Thunderstorm,"** by **Roscoe R. Braham;** and **"Details of Surface Discontinuties Associated with Thunderstorms,"** by **Harry Moses,** all three authors being associated with the **U. S. Weather Bureau Thunderstorm Project.** Outlined were results of two summers of intensive observation in central Florida and southwestern Ohio, with airplanes making a total of 1,363 traverses through active thunderstorms. The papers described the main features of the thunderstorm as an internally circulating mass of cloud air. It was explained that the storm or particularly the cells go through a life cycle starting as upward streams of rising warm air. After rain has developed, down drafts concentrated in the rainy areas are present. These vertical movements are reflected at the surface in the form of sudden wind squalls, temperature drops, and bursts of rain. Used in the study was a micronetwork of 55 surface instrument installations. It was further explained that air from the surroundings flows into storm mainly at upper levels although an outflow may occur at the surface and at heights above 25,000 ft. Described as a new finding is that rain itself is an important element in the thermomechanism.

Other papers presented at the Meteorological Session included **"Significance of Basic Research in the Upper Atmosphere for the Meteorologist and the Aeronautical Scientists,"** by **J. Kaplan, University of Cal.; "Cloud Seeding and Self-Propagating Rain and Snow Storms,"** by **Irving Langmuir, associate director, G. E. Research Lab.;** and **"Methods for Detecting Ice Nuclei in the Free Atmosphere,"** by **Vincent J. Schaefer, G. E. Research Lab.**

Delivered at the Aircraft Design Sessions was **"External Sound Levels of Aircraft,"** by **Thomas M. Edwards, R. L. Field, G. L. Pigman, and Pell Kangas, Civil Aeronautics Administration.** Reputed to the first comprehensive quantitative study of noise actually produced by aircraft and other sources in residential communities, the paper provided results of extensive sound level measurements in airport vicinities with craft varying in size from small, private-owner types to large four-engine commercial types. Sound readings were taken under a variety of conditions and at different distances from airplane paths. These data are presented so they may be applied to specific airport locations to obtain close estimate of existing sound levels. Discussion also dealt with effect of ground and atmospheric conditions on sound propagation.

(To be concluded next issue)

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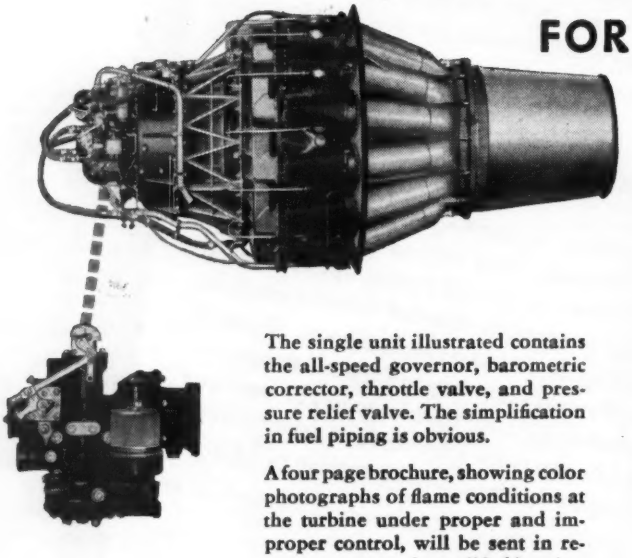

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New Rotor Suppresses Vibration

Single-lifting four-blade design affords increased smoothness. Better endurance, reduced maintenance features are embodied.

By GILES N. MONTGOMERY
(Engineering Staff, Doman-Frasier)

All too frequently—in rotorcraft mechanisms, as well as in other devices—"good" solutions pose additional problems.

Thus, in conventional 'copter design, though the flapping hinge or the universally mounted hub is introduced to cope with vital considerations of control and blade stressing, these units, in turn, bring the disadvantage of coriolis effect (discussed in the preceding article—Jan. 26 AVIATION WEEK).

• **Drag Hinge**—To overcome this destructive effect of coriolis on the flapping hinge rotor it is necessary to provide a means for each blade to displace itself laterally. The only solution that has proven feasible for this is to place another hinge at the root of the blade, with a vertical axis. The blade is now attached to hub with a complete universal joint and may always take a position, in its path around the craft, that will preserve dynamic balance. Aerodynamic drag trying to hold the blade back will be offset by centrifugal force holding the blade out.

However, here again, a heavily loaded bearing is required, oscillating through 2 or 3 deg., as is encountered in the flapping hinge.

The Doman rotor is not faced with this problem because no drag hinge is required.

• **Ground Resonance**—The drag hinge was a very neat solution to the coriolis problem. But unfortunately, each solution used in the flapping hinge rotor seems to bring a new problem—and the drag hinge is no exception. It subjects the craft to the phenomena of "ground resonance"—long a bugaboo of the rotary wing industry. Inasmuch as the drag hinge will permit the blades to displace themselves one from the other, the entire rotor can very easily become centrifugally unbalanced. Depending on rotor speed and the frequency of the landing gear and tires, a dance from one wheel to the other may be set up. Thus ground resonance, also the very destructive ground instability in which the dance of the wheel and the mispattern of the rotor aggravate each other, may ensue. With true ground instability the craft may turn over on its side in four seconds.

A number of things must be done in the design of a hinged blade 'copter to minimize these instability problems, but most vital is the incorporation of some form of damping device to suppress the motion of the blade about its drag hinge. This is intended to prevent build-up of the phenomena to destroying proportions.

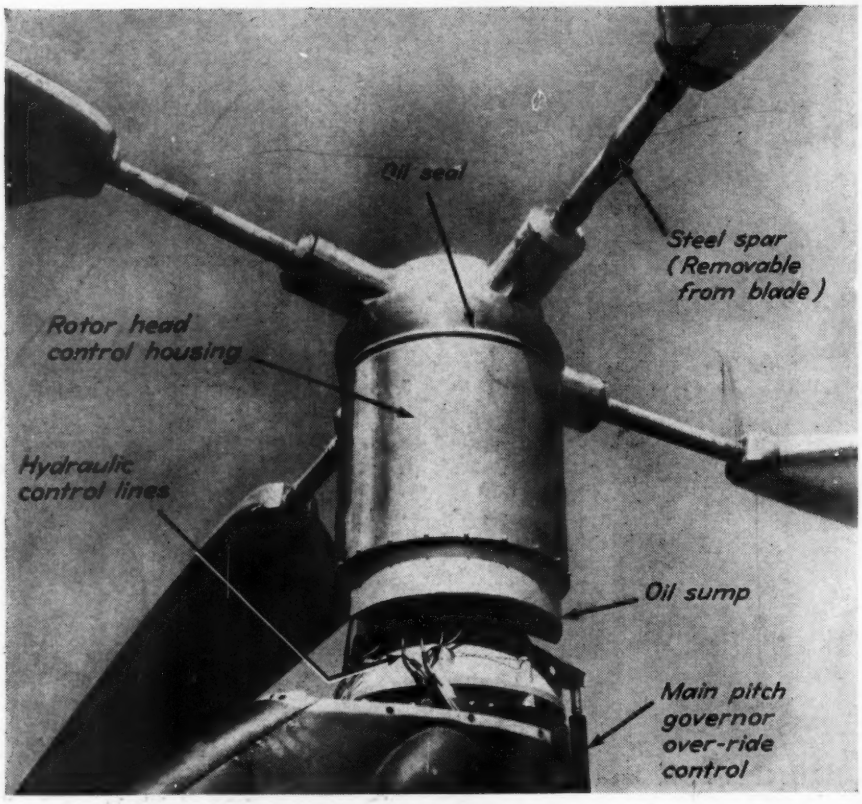
The Doman rotor has no drag hinge and is therefore not susceptible to the condition. Conceivably, the very flexibility of the blades might allow some semblance of ground resonance to develop, but in actual practice the blade stiffness is such that the condition cannot occur.

• **Blade Damper**—To suppress motion of the blade on its drag hinge to guard against ground resonance, most designers have incorporated hydraulic dampers from the blade to rotor hub. These must be perfectly matched to prevent rotor roughness. They will probably always remain a plague to service.

There is another and very serious consideration. If a device is used to suppress motion of the blade about the drag hinge, the very purpose of the latter is defeated. The drag hinge was incorporated to relieve coriolis stresses; but now with the drag hinge restricted by a damper the coriolis force comes right back into the blades.

The designer is forced into a compromise of supplying sufficient damping to ward off ground resonance and yet keep the blade shanks within reasonable stress limits. On large craft this compromise requires that the damper be equipped with a relief valve which will momentarily free it when sudden applications of cyclic pitch bring on large coriolis forces. That the pressure setting for these relief valves can be high enough for ground resonance protection and yet have the damper soft enough to prevent high blade stresses is a moot question.

The principles used in the Doman rotor make the damper unnecessary—because no drag hinge is used in its construction.



Doman rotor system. Hub tilts above oil seal to align with tip-path plane. Azimuth plate and hydraulic control mechanism in housing are pressure-oil lubricated. Spars are secured to hub with preset coning angle and drag angle offset.

• **Center of Gravity**—In a single rotor 'copter the center of gravity of the craft can be correct for only one attitude of flight without using cyclic pitch. For example, if the C.G. is directly under the rotor, the craft can hover without requiring the rotor to be tilted. For 100-mph. forward speed, the rotor must be tilted forward a certain amount and yet have some reserve tilt available to handle gust conditions. Because of the coriolis effect on a flapping hinge rotor or the universal joint effect on a conventional gimbal mounted rotor, the blade stresses increase as amount of inclination of the lift vector increases.

Had the aircraft C.G. in the case being considered been one inch back of the center of the rotor, a compensating amount of forward tilt of the rotor would have been required for hovering. This added amount would also be necessary for the 100-mph. condition and hence the blades would be stressed that much more. Because of this condition, the allowable C.G. travel to handle varying passenger or cargo loads is very limited. On single rotor 'copters for which information is available the limits are in the neighborhood of four or five inches. By the time the craft is built large enough to carry four people, this limited C.G. allowance severely hampers utility.

This confined C.G. travel, more than any other factor, has limited the single rotor 'copter to the 6,000-lb. gross weight class. The trend for larger machines has been to take the two rotor, fore and aft, configuration with all the associated expense and complexity.

Because of the constant velocity universal hub mounting in the Doman head, there are no stress increases through any amount of rotor head tilt. The only limit to C.G. loading of the craft is that of the main blades striking the tailcone or the tail rotor dragging the ground on landing. With the Doman configuration a multi-place single rotor 'copter of 14,000 lb. gross weight may be constructed. This is about twice the gross of any presently flying single rotor craft. Beyond this weight, the power required of the tail rotor in hovering becomes too great.

• **Blade Endurance**—There are other factors beside the coriolis effect that subject the blades to vibratory bending moments. The high lift that the blade is subject to on the advancing side in forward flight is primarily cancelled by the feathering action resulting from cyclic pitch change. In forward flight, the pitch of the advancing blade is reduced. The drag increase on the advancing side, however, will be only partially cancelled by cyclic pitch.

In addition to this, however, there will be a 2 per rev. lift and drag fluctuation on each blade in forward flight. Source of these stress producing force fluctuations is somewhat obscure. Mathematically it is because the equation for lift or drag on the blade involves a term containing the sine or cosine of twice the rotational angle the blade makes with the front of the craft.

These fluctuating forces on the blade, plus forces arising from gusts, pull-ups, blade center of pressure excursions, and any number of other sources will all contribute to shorten blade endurance life. The Doman rotor is the only one introduced to the public, which has an answer for this problem other than to beef-up the parts.

If a force of a given magnitude is applied to the rotor blade once, the blade will deflect a given amount and a given stress in the blade root will be produced. If the same force is applied at equal intervals, of say once every two seconds, the blade will deflect further with each impulse than it did when the force was only applied statically. It will have a correspondingly greater stress at the root. If the frequency of applying the given force is increased further the deflection is again increased with the root stress further amplified. Each increase in the frequency will produce an increase in the stress until at the natural frequency of the blade only a very small force need be applied to soon break the blade.

By making the blade very stiff, which usually means heavy, the natural frequency may be made very high. The frequency of the 2 per rev. forces acting on the blade will be very low by comparison, and hence have low amplification values. They will always, however, produce a greater stress than the same force applied statically.

The Doman rotor uses a different approach to this problem. Consider applying the forces to the blade at a frequency higher than the natural frequency of the blade. The deflection and stress start to come down again. In fact, if the applied force frequency is high enough, the deflection and stress will be much less than if the same force were applied statically. This principle is used in designing the blades on the Doman rotor. The frequency of the applied vibratory blade forces and the designed natural frequency of the blades are such that the stresses are much lower than were the same forces when applied statically. For this purpose the blade has a very low natural frequency and hence is limber and of lightweight construction. The flexible blade also exhibits excellent stress suppression qualities under gust loads and pull-ups.

Use of this principle plus complete absence of any coriolis or universal joint effects enable the Doman rotor, flying on a 'copter of 2,500 lb. gross weight, to fly at 100 mph. with vibratory blade

(*Continued on page* 27)

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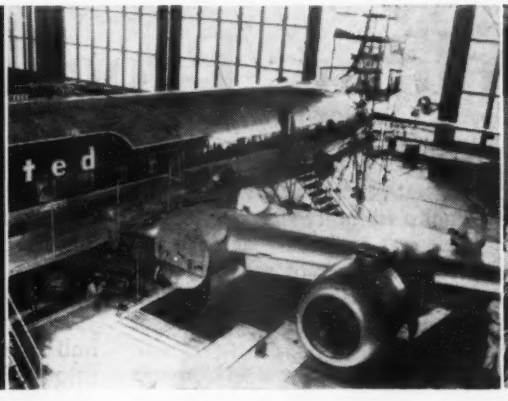
MR. W. P. HOARE, *Director of Maintenance Bases, United Air Lines*



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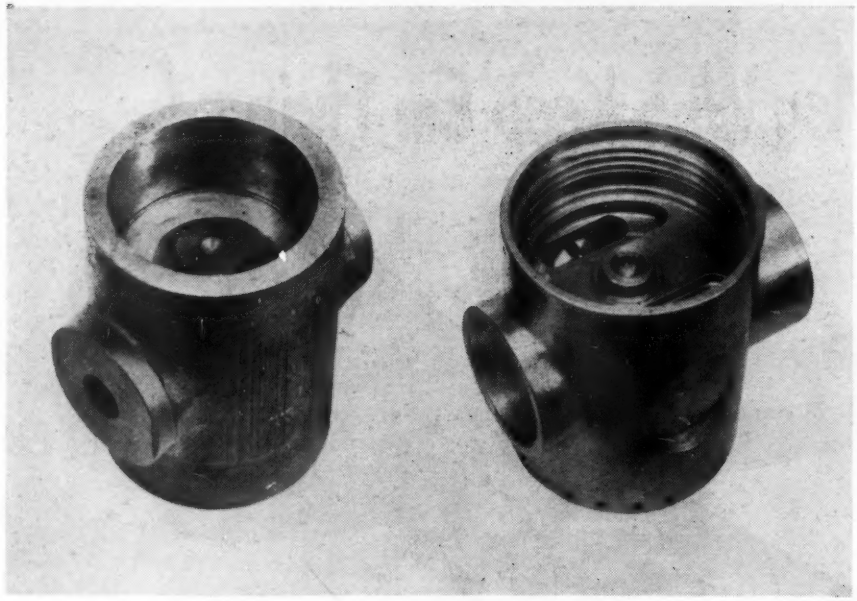


Fig. 1. Shown at left is hub forging which has been partially machined, for comparison with finished hub (right) comprising former design on Aeromatic Model 220 prop.

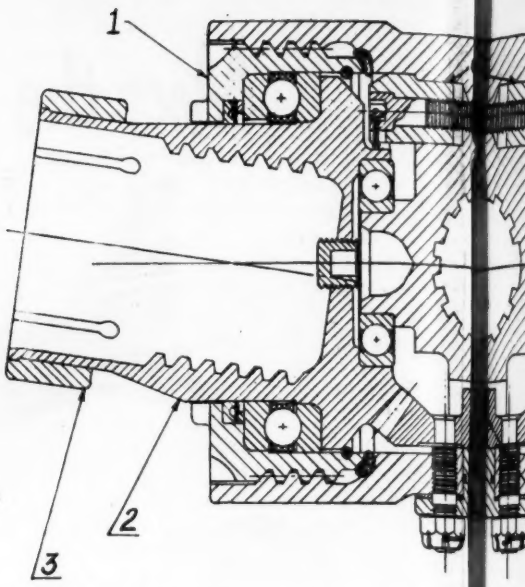


Fig. 2. Section of components in former forged 2[illegible]gn. P[illegible] clamp, (4) synchronizer shaft, (5) synchronizer, [illegible]6) pit

Aeromatic Welding Procedures Lowe[illegible]

Recent research into propeller hub manufacturing techniques has indicated that present methods of machining hubs from steel billets are not only expensive and wasteful but impose unnecessary weight penalties on the entire assembly.

To simplify procedures, the Aeromatic Propeller Div. of Koppers Co., Baltimore, makers of automatic pitch propellers for lightplanes, has been investigating the feasibility of using welded construction in place of the present machined forgings.

This project has been under the direction of Paul F. Hackathal, chief engineer; C. C. Mast, shop superintendent; and D. W. Hamilton, welding foreman.

Their work showed such potentialities that a paper, "Development of Arc Welded Propeller Hubs," written by these men, with assistance of John D. Waugh, public relations representative; T. F. Naylor, materials engineer; and V. B. Benfer, sales engineer, won the grand award in the James F. Lincoln Welding Foundation's 1947 contest. These contests have been acclaimed by industrial leaders for the vast amount of valuable new welding technology and practice disclosed in the award-winning papers.

The hub-welding details described here are based on methods outlined in the prize-winning paper.

Early in the experimental work, it was found that a propeller hub scarcely ever broke from steady stress, which was calculable, but generally failed from the fatigue due to vibratory stress. Since the latter stress was not easily determined, and is still the source of much investigation, enormous safety factors in terms of metal bulk were built into propeller hubs.

The finest high alloy steel forgings obtainable became the generally accepted hub material. These huge forgings represented high cost from start to finish and still do as in the case of a present high horsepower hub, which as a pierced forging weighs approximately 300 lb. and is machined down to about 50 lb. However, high structural integrity has been achieved, and retention of blades against centrifugal loads of 75 tons and more is no longer a problem with the large propellers. It is the effect of this accepted, and now traditional, method of high-power-absorption hub construction on the design of low horsepower propellers, which provides a basis for this comparison.

Welding for hub fabrication among numerous developers apparently just wasn't considered because of the view that welding would not be strong enough for this very highly stressed part; also, forging was the only practice in successful use. The one, notable, exception taken to this view is embodied in the manufacture of the present Aeromatic variable-pitch propeller hub.

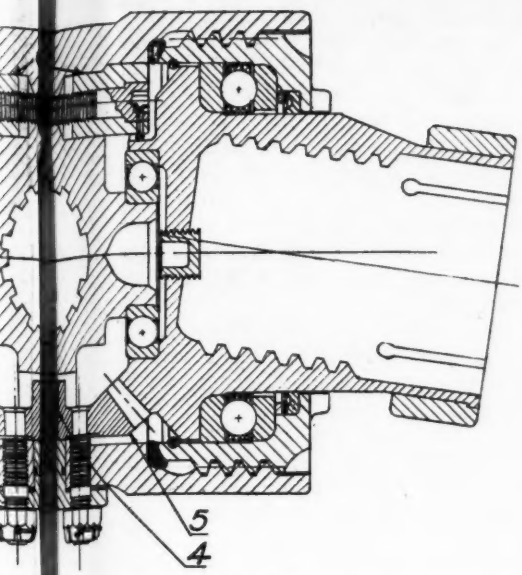
► **Hub Development**—The original steel hub forging (on Model 220), with some preliminary machining completed, is shown in Fig. 1 with the finished machined and ground hub. The forged billet of chrome-moly steel weighed 64.7 lb. and was machined to a finished weight of 17.8 lb.

Design characteristics of the finished hub include the large cylindrical socket into which the blade retaining flange and retaining nut fits and the cross bore through the hub center which is splined to fit a particular size engine shaft.

These two principal bores must have an accurate dimensional and high strength relationship because of the retention of the entire centrifugal and bending loads of the blades by the large cylindrical hub socket, and the engine driving torque by the shaft bore. Other integral features of the hub shown are: Buttress threads for blade retaining nut, boss in base of hub socket to position the blade journal bearing, aperture through side of hub wall for a shaft, and a milled slot from one socket to the other to accommodate a gear to synchronize blade movement.

These features are indigenous to the Aeromatic propeller design in that they comprise all principal hub features in the absence of any actuating mechanism requiring auxiliary power.

Controllable pitch propellers may have similar basic hub structures with pitch change mechanisms added. But, in the absence of the servo devices, the retention of blades so they may rotate, adjustable stops to limit their movement, and a synchronizing means com-



...ged 2...ign. Parts are: (1) Nut, (2) flange, (3) counterweight ...izer, ...) pitch setting stops, limiting angular travel.

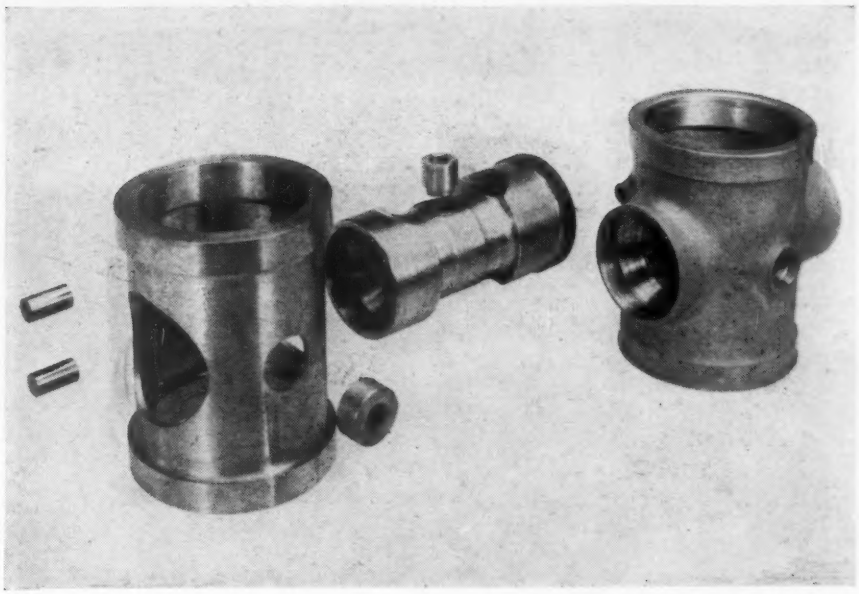


Fig. 3. At left are seen components required for fabrication of present arc-welded Model 220 design. With parts assembled and welds ground, complete unit is shown at right.

...we Hub Costs

Propeller hubs of arc-welded tubular design slash weight, fabrication time, and expense.

prise the total basic hub requirements.

Fig. 2, a cross-section of the forged steel hub, shows the relative positions of principal and detail parts. Inclined blade retaining flanges are shown mounted on a radial journal bearing fitted to the hub boss and retained by a buttress-threaded nut and ball thrust bearing. Synchronizer gear is held in place between teeth on each flange by a synchronizer shaft bolted to hub wall. Blade pitch setting stops, which limit angular travel of the blades, are fitted into drilled holes in a milled slot in blade socket base. These pitch setting stops were in an inconvenient spot in this design. Changing their settings is a procedure which must be performed repeatedly when the propeller is being adjusted to control engine speed accurately. Removal of the entire blade assembly, each time adjustment becomes necessary, entailed considerable time.

Such features, in addition to the disadvantage of carving the whole hub out of a forging, could be improved only by an entirely new design fabricated by another method.

Since steel castings had demonstrated weakness, and aluminum alloy forgings, though light, were virtually as expensive to machine as steel and also would fatigue, welding was the apparent solution although it had never been used in this particular application.

▶**Design for Welding**—In the breakdown of the 220 hub for welding, the barrel and cross tube, shown in Fig. 3, were machined from seamless alloy steel tubing. To expose the pitch setting stops for adjustment, bosses made from bar stock were designed to be welded into holes in the hub barrel wall and threaded for externally accessible bolts. Synchronizer shaft which had previously been bolted to the hub wall was to be threaded into a boss machined from bar stock and welded to hub wall. With the cross tube welded into hub barrel, the boss for positioning the inner journal bearing (also machined from bar stock) could be welded to the cross tube.

To balance the assembly, a simple piece of curved plate would be welded to the inner hub wall. Threading the inner lip of the hub barrel for a retaining nut was eliminated by using an internal expanding snap-ring in a groove. Manufacture of these parts was far less costly than a forging and its machining. Substantial weight reduction was possible because superfluous metal, not removable economically from the forging, if at all, was absent with the tubular construction.

Hub barrel and cross tube of the present design are machined from electric-furnace aircraft-quality seamless steel tubing (SAE 4130) purchased in finish annealed condition. Both hot finished and cold drawn tubes have been welded with success. The bearing boss, welded to the crosstube, is 4130 steel. Synchronizer boss, pitch stop bosses, and balance weight are all SAE 1020, normalized. These parts, shown in Fig. 3, may be referred to in the following welding sequence.

▶**Welding Steps**—Cross tube is positioned through holes bored in hub barrel in a jig holding the balance weight against hub inner wall, and synchronizer boss in position in hub wall. These components are then atomic-hydrogen tack-welded, making smooth shallow tacks that may be passed over with an arc later with no perceptible rise or slag. The tacked assembly is preheated to between 500-600 deg. F., then placed in a positioning jig. A fillet weld is made first at junction of cross tube and hub wall, externally, with a $\frac{5}{32}$-in.-dia. Planeweld No. 1 electrode using approximately 130 amp.

After this the hub is normalized for ½ hr. at 1,500 deg. F. and cooled in still air. It is then shot-blasted with angular shot, the welds ground, and holes drilled in hub wall to receive pitch stop bosses; the transverse hole in the cross tube is reamed to receive the bearing boss. This intermediate machining is necessary so that stresses in the welds of smaller parts, yet to be added, are minimized.

Stop bolt bosses are now fitted into the holes in hub wall and atomic-hydrogen-tacked in a jig. Bearing bosses are pressed into cross tube and hub is again preheated to 500-600 deg. Welding is accomplished with $\frac{1}{8}$-in. electrodes laying a fillet bead at one pass around each boss on external surface of hub wall.

Penetration of the weld at the bosses

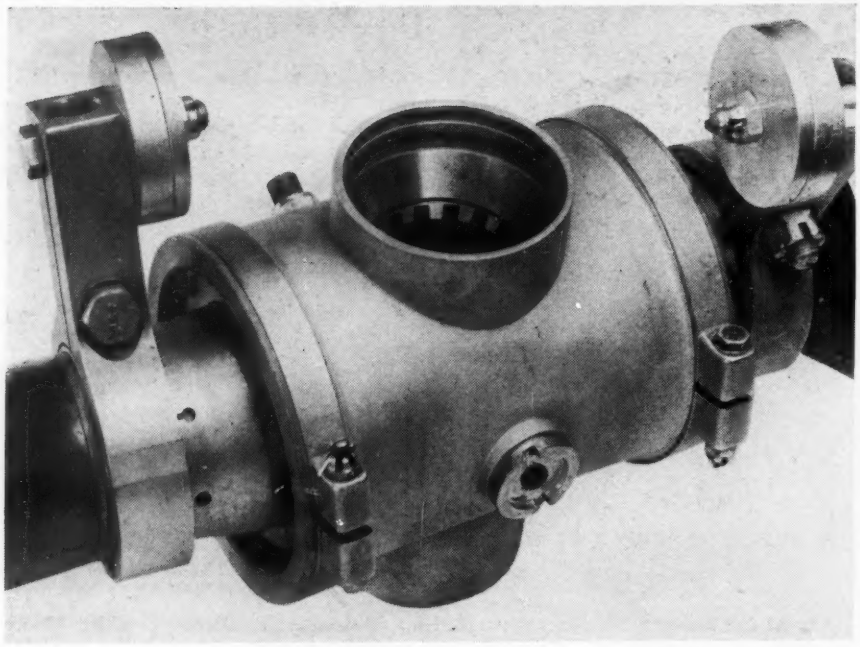


Fig. 4. This is experimental version of Model 220 hub on which all welding is accomplished internally in order to eliminate time-consuming and costly bead grinding procedure.

is not required to be as great as that of welds at either end of cross tube because they do not carry appreciable loads. Cross tube-to-hub barrel weld, however, does carry substantial shear stress due to torque and must be entirely free from defects which torsional vibration could aggravate.

Following final welding, hub is again normalized and heat treated. It is quenched in oil at 1,550 deg. and drawn at 1,020 deg. for 4 hr. After final shot blasting, hub is Brinell tested for a 250-276 reading and given a ferro-magnetic inspection check before grinding and final machining.

Tubular hub components receive a good turned finish initially so only the weld bead needs blending attention. A splatter-proof coating reduces adherence of weld particles and subsequent shot blasting removes particles that stick. Slag is also removed by shot blast, eliminating hand removal for any purpose other than exposing the end of a bead for continuance of welding or for weld inspection.

Welds are ground with coated wheels and Carburs, the blended area extending approximately $\frac{3}{8}$ in. on either side of weld. After grinding, hub is thoroughly inspected by the wet magnetic method for cracks, slag inclusions, or excessive porosity.

The welding technique of experienced operators is so highly developed that rejections are unbelievably low and not comparable to machining rejections in quantity.

Welded jigs are freely mounted and counter-balanced so they may be swiveled by light touch with no tendency to produce irregular motion. Heavy universal jigs were found to lag or jerk from friction of weight and inertia, preventing steady rotation and smooth tilting during welding.

As time figures will show, welding of this hub, while of a precise and critical nature, has been reduced to a repetitive technique that may be conservatively considered to have no known parallel in its class.

► **Experimental Trend**—A current experimental development is shown in Fig. 4—Model 220 hub welded internally, object being to eliminate weld grinding completely and accomplish a new disposition of the pitch stop bolts by dispensing with their bosses.

As previously noted, the cross tube was welded to hub barrel at front and rear, the synchronizer shaft boss was welded, and four bosses also welded, all externally, into hub wall holes. Grinding naturally entails time and cost, particularly around pitch stop bosses. By making all pitch stop boss welds internally, no structural change is necessary and cost savings are reflected.

The balance weight (previously a small thick block) was made out of thinner plate covering a greater area of the hub wall and welded in place as before. This gives greater wall thickness through which pitch stop bolts may be threaded without supporting bosses. Potential advantages of eliminating the four machined pieces merely by inclusion of a larger weld plate indicates the extent of total benefits which may become possible with arc welded fabrication.

This development—quite new and still undergoing extensive test—is offered primarily to emphasize fabrication versatility and design latitude permitted by arc welding. If it should supplant the current production hub, there would be no machining jig changes, only one drill jig change, and only slight modification in arrangement of welding jig. Thus, what could be an expensive engineering change, considering machining methods, can result in a beneficial modification with immediate savings.

► **Cost Considerations**—The cost and weight data are consolidated in Table I, to show exact extent of savings realized with arc welding versus forging. Total figures are given in all instances because details vary and are superfluous for this study. The 42.8 percent cost reduction determines the price and extent of the market more than any other factor. However, weight saving of 31.5 percent is almost equally important due to its influence on total aircraft weight, and can be applied to the personal plane in terms of increased performance without the increased cost of greater horsepower.

Indirect benefits, such as greater baggage capacity, become factors of utility which are competitive points within the industry.

The first ground-adjustable hub, machined from a solid forging, is shown in comparison to the present arc welded hub, in Fig. 5.

Breakdown of the ground-adjustable design for welding is extremely simple. Hub barrel consists of a single tubular piece slotted on each end, threaded internally and has a cross tube, each end of which is almost as large as the hub barrel. These bell shaped ends on the cross tube accommodate front and rear cones and the retaining nut which secures hub to shaft. By making the

Table I.—Cost-Weight Data

Forged vs. Welded—Repetitive Production—Model 220

	Raw Material Weight	Raw Material Cost	Standard Machine Time Man-Hours	Direct Labor Cost	Total Cost (Including Burden)	Finished Hub Weight
Forged Hub.....	64.7 lb.	$10.36	16.4	$20.50	61.61	17.8 lb.
Welded Hub.....	47.1*	6.80**	9.1***	11.38	35.25	12.2
Gross Saving.....	17.6	3.56	7.3	9.12	5.6	5.6
% Savings.....	27.2	34.4	44.5	44.5	42.8	31.5

*Includes 1.2 lb. Planeweld No. 1.
**Includes $.14 welding electrode cost.
***Includes .98 hrs. welding time.
Note: Burden means direct labor with all overhead and operating costs included.

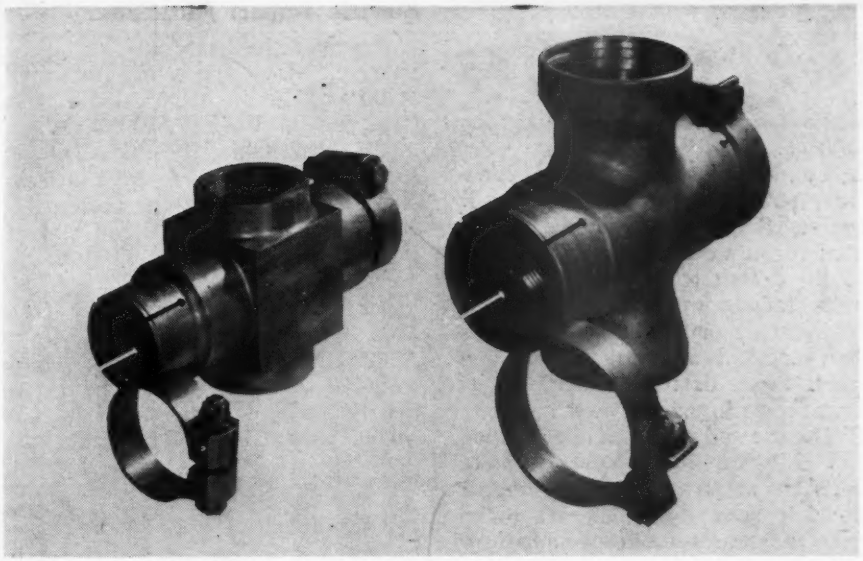


Fig. 5. Forged design, ground adjustable hub (left) is applicable to 65 hp. installations, while present tubular welded design (right) is suitable for 150 hp. engine applications.

cross tube from two pieces, each extending halfway into the barrel bore, it was possible to maintain a smaller barrel diameter than would have been possible were the cross tube made from one large section.

Barrel diameter with this arrangement is held at a minimum, wall thickness is easily controlled, and weight is exceptionally low.

Method of welding this hub consists of making a fillet weld at one pass around both front and rear of the barrel at junction of entry of each half of the cross tube. The cross tube halves meet in the center of the barrel bore where their mating, step cut, ends are pressed together. Weld beads are made with a $\frac{5}{32}$-in. Planeweld electrode.

The process steps follow very much the same pattern as the welding on the 220 hub. Grinding of the weld beads is the only operation consuming appreciable time, but a design to make the welds internally may eliminate this. Joint of the cross tube ends in the center of the barrel is not welded because it is not necessary.

In every instance the welds on all hub designs are as strong or stronger than the parent metal and have given no difficulty in service. The fact that a given weld does not penetrate the wall of the hub, or an opposing weld is lacking, is not of great importance because destruction tests, theoretical studies, and vibration tests have demonstrated the efficacy of the simplified process used.

Table II figures on ground-adjustable hub manufacturing cost, time, and weight apply specifically to the 65-hp. forged and the 150-hp. welded design because they best illustrate the gain with welded construction. Close relationship of all figures is deceiving unless the increased horsepower application of the welded design is noted. It is only through the use of arc welding that it is possible to manufacture the adjustable model on an economically practical basis.

Summation of the overall benefits of production arc welding of Aeromatic propeller hubs is best expressed by the fact that the company will save in excess of $205,000 on direct labor and raw material this year at the present rate of production.

Arc welding the principal component permits use of tubes, drop forgings, and simple machinings attaining a cost reduction impossible with any other practical process. Flexibility of manufacture afforded by arc welding permits disposition of all adjustment devices externally, so the inner works need not be disturbed for minor adjustments and subsequent minor design changes can be made with no appreciable tooling cost.

Successful application of arc welding to a flight component, whose strength requirements most aircraft engineers respect, should dispel doubts as to strength characteristics of arc welding and impress lightplane makers with selling price reductions possible. For, only this way will we realize an ever wider acceptance of the personal plane.

T: le II.—Cost-Weight Data

Forged vs. Welded—Ground Adjustable Propeller Hub	65-hp. Forged	150-hp. Welded
Raw material weight..	35 lb.	32.6 lb.
Raw material cost....	$4.60	$5.22
Finished weight.....	9.3 lb.	8.7 lb.
Machining time.....	4.9 hr.	4.1 hr.
Total Cost (Including Burden).....	$19.91	$18.03

Doman Rotor (from p. 22)

stresses of less than one tenth of their endurance limit.

• **Bearing Endurance**—Maintenance has proven to be an expensive part of 'copter operation. Poor bearing life is one of the major factors. With exception of the feathering bearings carrying centrifugal thrust of the blades, there are no heavily loaded bearings in the Doman rotor, and these blade thrust bearings are unloaded in flight by hydraulic oil pressure. The entire rotor mechanism is contained in a housing which permits all of the parts to be pressure-oil lubricated. Bearing problems are precluded under these conditions.

• **Aircraft and Control Roughness**—In forward flight the individual blade is subject to varying lift changes and pitching moments. Each blade will have a very high 1 per rev lift and pitching moment change, a reasonably high 2 per rev change, and a small change occurring at 3 per rev. There are also higher orders of changes, but they involve insignificant energy.

Lift variations will shake the aircraft and the blade pitching moments will shake pilot's control stick. Insofar as fuselage and stick are concerned, it is fortunate that the phase relationship of the forces on one blade will cancel some of the forces on another. The greater the number of blades the more the cancellations.

On a one-bladed rotor there will be no cancellations.

On a two-bladed rotor the 1 per rev lift variation cancels. The 2 per rev lift change adds to shake the aircraft at this frequency. The 1 per rev pitching moments on the blades add to shake the control stick twice every rotor revolution. The 2 per rev pitch change does not molest the control stick, but it does jerk the collective pitch control.

On a three-bladed rotor, both the 1 and 2 per rev blade lift changes cancel. The 3 per rev, however, adds. The 1 per rev blade moment change places a steady side force in the control stick. The 2 per rev moment changes shake the stick at 3 per rev.

On a four-bladed rotor, 1, 2, and 3 per rev lift changes cancel. There is complete cancellation for 2 per rev blade pitching moment fluctuations. The 1 per rev gives steady force on stick.

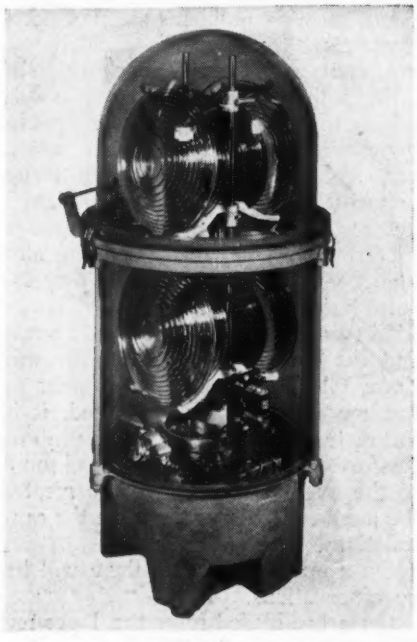
The Doman rotor employs four blades. It is the only single lifting rotor in the United States flying at this time, offering this feature.

Many presently flying 'copters have had to incorporate irreversible features into the controls to enable pilot to endure a flight of any length. The Doman rotor requires no such devices because of the force and moment cancellations made possible by using four blades.

NEW AVIATION PRODUCTS

Airport Rotating Beacon

A low-cost, low-maintenance, 100,000 cp. rotating beacon is announced by **Westinghouse Electric Corp.**, P. O. Box 868, Pittsburgh 30, Pa. Available for lighted or unlighted small airports or for small seaplane bases, device is equipped with transfer relay so that if service lamp burns out, auxiliary lamp is



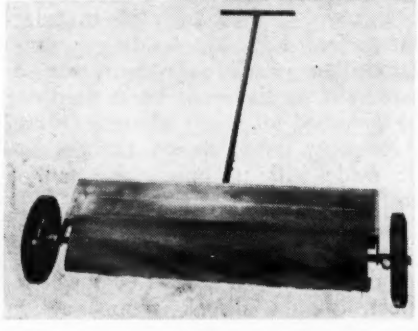
turned on instantly and indicator contact is closed to give warning that service lamp must be replaced. Relay resets automatically when service lamp is replaced or in accidental trip-out of switch during maintenance. All exterior metal parts are finished in CAA color requirements. Beacon is totally enclosed under rubber gasketed glass dome and is represented as not affected by sleet, rain, or temperatures from −45 deg. to 130 deg. F. Two identical optical systems, each with four doublet lens arranged in pairs project two concentrated beams 180 deg. apart for 10-mi. visibility under normal flying conditions when 500w. airway beacon lamp is used. Color lenses are available conforming to requirements of Specification AN-C-56, Type I, Grade D. Beams can be adjusted from 0 to 12 deg. above horizontal as required. Revolving beacon operates on 115v., 60c. supply. Weight is under 100 lb.

Records Engine Power-Hours

Functioning as practical means for determining time for aircraft engine servicing, "Power-Recorder," developed by **Kollsman Instrument Div. of Square D Co.**, Elmhurst, N. Y., gives cumulative power-hour units turned out by engine, thus providing indication of total engine wear. Device, also applicable to aircraft rental operations, computes total power-hours produced by continuously measuring engine speed and manifold and atmospheric pressures. Power data are obtained in accordance with engine power curves for all throttle and propeller pitch settings and altitudes. Rate at which power units are registered is directly proportional to power-hours delivered by engine, and results are given in terms of equivalent hours at cruising power, registering 100 units per hour if craft is flown at normal cruising power. Two types of recorders are offered, one with flexible shaft connection to engine tachometer outlet, other being remote operating type electrically driven by tachometer generator. Apparatus prints cumulative power units and engine identification number in timeclock fashion so that record may be filed for reference. Visual counter-part indication is also available.

For Scrap Pickup

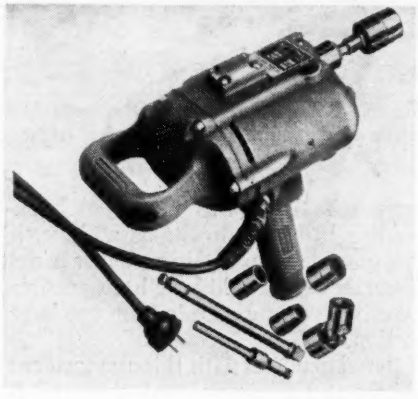
Suitable for use in aircraft plants and at airports is Cesco magnetic sweeper designed to remove scrap metal and nails from manufacturing areas, loading yards, and airstrips. Made by **Columbia Engineering Service Co.**, 593 Market St., San Francisco, Cal., unit is available in sizes from 12 to 72-in. sweeping widths. Series of permanent Alnico magnets are mounted on alloy steel axle with rubber-tired ball bearing wheels. Canvas cover fastens to retainer pan, passing over assembly and under magnets, where it is held in place by small steel rod in end of canvas. When magnets are loaded, magnetic assembly,



pivoted on axle, is turned up, operator taking hold of metal rod in free end of canvas and pulling back toward handle until pickups fall into pan.

Electric Impact Nut Setter

Represented as heavy duty, high speed unit, portable electric impact nut setter, Speed-o-matic, is offered by **Illinois Gage & Mfg. Corp.**, 4639 W. Washington Blvd., Chicago 44, Ill. Torqueless device, stated not to twist in operator's hands when nut becomes tightened, drives nut or bolt 1,750 rpm. at free speed. At point of resistance, impact unit automatically delivers 3,000 impact blows per min. Instantly reversible, device is equipped with 25 ft. of cord and plug with ground wire. Operation is on 110v., 60c., a.c. or d.c. Length is 12½ in.; weight, 13½ lb. Capacity is up to ¾-in. bolts or nuts.



Information Tips

Analysis of Grinding Defects

For aircraft machine shop personnel and inspectors, new booklet published by **Norton Co.**, Worcester 6, Mass., is up-to-date and complete treatment of available information on subject "Injuries in Ground Surfaces." Publication features many photographs which show clearly numerous types of defects, such as cracks and burns, found in ground surfaces. Makers of tool steel, tools, dies, and hardened steel parts have found information helpful, and metallurgists will find value in information on detection of injuries and attendant trouble shooting.

Bronze Electrode Welding

"Welding with Ampco Bronze Electrodes," is new bulletin W-17 issued by **Ampco Metals, Inc.**, Milwaukee 4, Wis., containing factual information on how to weld wide variety of alloys using bronze arc welding electrodes. Included is detailed information on welding procedures and techniques as well as comprehensive charts listing alloy types, specifications, chemical compositions, physical properties, and weldability values.

Ignition Harness

New line of wiring harness, custom-built especially for plane on which installed, is announced by **Caldwell Industries, Inc.**, Kent, Ohio.

Plant Accessories

Folder issued by **Yale & Towne Mfg. Co.**, Phila. Div., Phila. 24, Pa., lists various production-facilitating devices. Included are industrial and lift trucks, hand and electric hoists, and dial scales.

Weathering Tests

New range of prices for Weather-Ometer tests, method of testing for determining resistance of textiles, paints, plastic materials, and coated fabrics, is announced by **United States Testing Co.**, 1415 Park Ave., Hoboken, N. J.

FLIGHT 3...COMING IN...ON SCHEDULE

The safe arrival of flight after flight typifies the progress of the aviation industry. It is due, of course, to many factors . . . only one of which is oil. But the fact that so many experts acclaim Wolf's Head Oil as an important contribution is a great source of pride.

Wolf's Head Oil—100% pure Pennsylvania, premium grade—is a superior refinement of only the finest Pennsylvania crude. Ever since Kitty Hawk, Wolf's Head has kept in step as aircraft engines have developed. It has long had a name for top performance. Today it is recognized as the "finest of the fine" aviation oil. Wolf's Head Oil Refining Co., Oil City, Pa., New York 10, N. Y.

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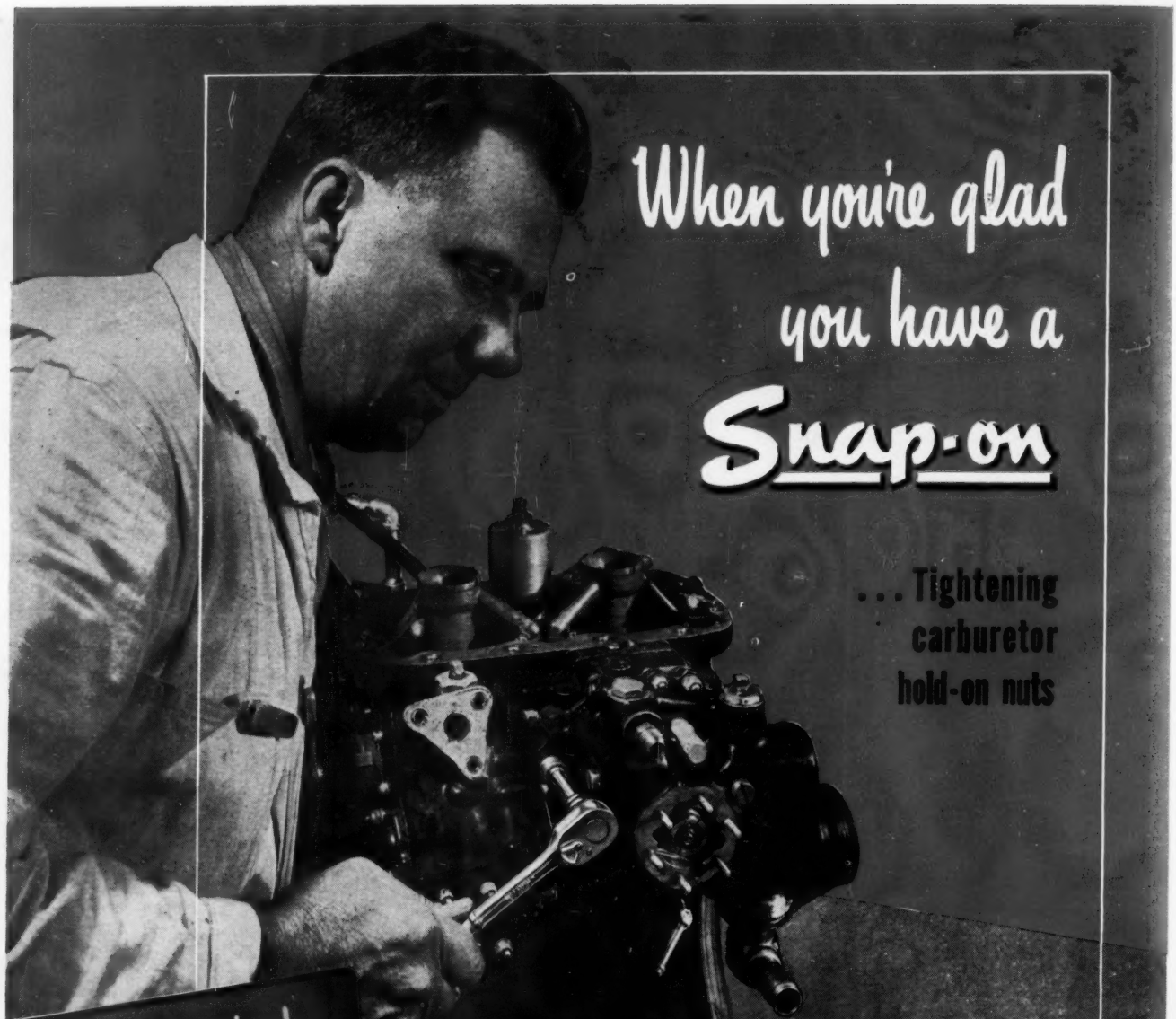

Snap-on's NEW FERRET SET!

A new design . . . strong . . . adaptable . . . essential in the aviation mechanic's tool kit!

All units redesigned to give greater utility, plus a wider range of socket sizes from ¼" to ⅞". A new ratchet that works in half the space previously required . . . sockets that grip tight onto the handle, yet are easily interchanged.

These slender wrenches squeeze into tight places to turn those hard-to-reach nuts and bolts and make quick, easy work of the tough jobs on modern engines, carburetors, generators and other intricate units. Ask your "Snap-on man" to show you this complete Ferret Set or write for complete detailed information.

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16,023 Personal Planes Sold During 1947; Value $53,206,000

Forecasts of 1948 market vary from 8,000 to 20,000 planes, with trend to buying four-placers considerably stronger. Dollar volume may rise.

By ALEXANDER McSURELY

A total of 16,023 planes, with manufacturers' value of $53,206,000 sold by principal American personal plane makers in 1947, compares with 1948 sales forecasts ranging from 8,000 to 20,000 planes. Majority of available forecasts expect the 1948 total to be below or at best at the 1947 figure, but it is also thought that increased sale of four-place planes will bring dollars per plane up.

Dwane Wallace, president of Cessna Aircraft Corp., Wichita, and chairman of the Personal Aircraft Council, Aircraft Industries Association, points out that although the 1947 total is less than half the number (35,000) of planes sold in the first full postwar year, 1946, it is still nearly two and a half times as many planes as was sold in the best prewar year, 1941.

▶**Four-Place Trend**—Trend toward larger planes and away from two-placers is already well established in the 1947 total figures, which show that 8,038 three- and four-place planes were sold as against 7,940 two-placers.

This fact is significant in that it shows a buying trend toward more expensive types of airplanes because of their greater usefulness. With several additional lower price-bracket four-placers scheduled for introduction this spring and a heavy emphasis on sales of four-placers, it is indicated that four-place sales will increase, barring major economic changes.

▶**Trade-In Problems**—With the increased percentage of four-place sales, dealers and distributors are encountering trade-in problems with used two-placers whose owners now want larger planes. Increased margin for dealers and distributors appears necessary. It is noteworthy that Stinson, which has probably the most liberal dealer margin policy, had the largest number of sales for any one plane—2,662 for the Voyager in 1947.

Piper led the manufacturing race with a total of 3,564 planes, of which 2,158 were three-place supercruisers and 1,406 tandem trainers, most of them the new Cub Specials. Cessna was second with 2,390 planes, of which all but 69 were two-placers. After third-place Stinson came Aeronca with a total of 1,726 planes, but of these 508 were military liaison L-16s, leaving a total of 1,218 civil lightplanes sold. Luscombe with a total of 1,401 two-placers came next and also led the two-placer sales for the last two months of 1947 with 217 planes sold. Beech sold 1,209 four-place Bonanzas for a dollar volume of $7,945,000, second only to Stinson's dollar volume of $11,525,000.

▶**Reports Listed**—Other company sales reports for the year: Bellanca, 214 planes, $1,070,000; Engineering Research, 805 planes, $2,084,000; Fairchild, 16 (personal) planes, $71,000; Funk, 41 planes $155,000; Republic, 818 (personal) planes, $3,902,000; Ryan, 18 (personal) planes, $125,000; Taylorcraft, 196 planes, $366,000; North American, 853 (personal) planes, $5,021,000. Texas Engineering Manufacturing Co. made 143 Swift 125s and 66 Fairchild F-24s, $787,000.

Interesting note in total 1947 personal aircraft sales picture was added emphasis on export which increased 20 percent by units and 97 percent by dollar value over 1946 exports. The 1947 exports totaled 1,669 planes valued at $6,496,812 as compared to 1,383 planes valued at $3,298,342 in 1946. The exports were about 10 percent of total sales in number and 12 percent of total sales in dollar volume.

▶**Export Leaders**—Argentina with 385 planes and Canada with 264 planes were the largest customer countries with the bulk of the shipments to Latin American countries. These included: Brazil, 155 planes; Chile, 20 planes; Colombia, 12 planes; Costa Rica, two planes; Cuba, 27 planes; Ecuador, three planes; El Salvador, two planes; Guatemala, four planes; Haiti, three planes; Mexico, 87 planes; Nicaragua one; Panama, eight; Paraguay, three; Uruguay, 27; and Venezuela, 12. Total exports to European countries amounted to 176 planes.

Relatively small number of personal planes going to Europe indicates that there is little real threat to personal plane sales in the recent plan announced by the Department of Commerce to reestablish war-time licensing restrictions on exports (including personal planes) to Europe on Mar. 1. Dollar shortages in most of the European countries are such that they are not likely to become major buyers of U. S. planes in the near future, whether licensing prevails or not.

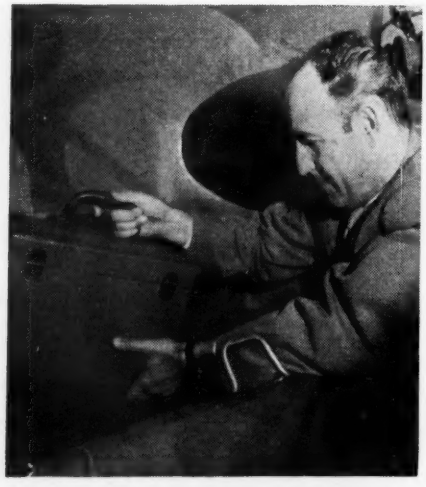
SCORES MIDGET SWEEP

Bill Brennand, 20-year-old winner of last year's Goodyear Trophy race for midget planes at Cleveland, made a sweep of the major events for midget racers, by winning the first Continental Motors Trophy race at the recent Miami (Fla.) Air Maneuvers. He flew the same plane which won at Cleveland, the Wittman Special, built by Steve Wittman, Oshkosh, Wis. Photo shows C. J. Reese, Continental Motors president, presenting the huge trophy to Brennand, with the winning plane in the background.

Cessna Bids For Four-place Leadership

UNUSUAL AERIAL CLOSEUP

SLIDING FRONT SEATS



BAGGAGE COMPARTMENT

ROOM FOR FOUR IN 170

(Photos by Ross-Pix)

On an all-round basis of low price, attractive appearance, reasonably good performance with economy, and producibility, the new Cessna Model 170 now looks like "the plane to beat" for other entries in the highly competitive four-place personal plane market of 1948.

Whether the plane gets into full production early enough this year to be readily available at the peak market season will probably be a main factor in its sales record. Deliveries are scheduled to begin in March, assuming CAA certification and other delays and obstacles are hurdled according to plan. Earlier pricetag of $5,475 flyaway Wichita is unchanged.

Externally, the 170 closely resembles the two-place Cessna Model 140, although the four-placer has a cabin 5 in. wider, and fuselage 4 ft. longer. Its wingspan is 3 ft. 2 in. greater, and the tail is somewhat larger. (Wingspan is 36 ft. Length is 25 ft. 6 in.)

Interior arrangement has two separate front seats which slide to rear on tracks. Back of the rear seat folds forward for access to luggage compartment much like the Model 140 luggage hold. Sliding front seat arrangement, wide door and a "buggy step" combine to make entrance to plane easier than is the case with most of its contemporaries. Accompanying photo shows effect of sliding one seat back while pilot's seat remains in normal position. Other photos show unusual closeup flight picture of the 170, a view of the plane warming up on the ground with its full complement of four persons, and an interior closeup of the baggage compartment arrangement.

Approximately 75 percent of 170's parts are interchangeable with various parts of the smaller Cessna 140 or the big Cessna 190. Result is that Cessna dealers can stock a relatively small numerical inventory of parts and supply all three basic models at a saving to them as well as to manufacturer and presumably to consumer.

Sale of four-place planes in 1947 totaled 5925 (Personal Aircraft Council report), with the largest volume by any one manufacturer (Stinson) about 45 percent of the total. Analysts expect an increasing sales emphasis on four-placers in 1948, and a greater proportion of total sales, perhaps 70 percent, will be in this category. With estimates of the 1948 market ranging from 20,000 downward to a low of 8000, this might make the four-place market somewhere between 14,000 and 5,400 as the field for the Model 170 and competitor planes.

Reservations Defined

President Truman has announced designation of three new air space reservations in the vicinity of Clinton Engineering Works, Oak Ridge, Tenn.; Hanford Engineer Works, Richland, Wash., and Los Alamos Project, Santa Fe, N. M. Airspace above these areas is set apart for national defense and other governmental purposes so that no person shall navigate an aircraft within the airspace except in the interest of national defense or by authority of the U. S. Atomic Energy Commission.

Reservations are described as follows:

▶ **Oak Ridge**—Beginning at latitude 36° 00′ 25″ longitude 84° 07′ 05″; thence to latitude 35° 51′ 35″ longitude 84° 16′ 25″; thence to latitude 35° 52′ 10″ longitude 84° 24′ 15″; thence to latitude 35° 55′ 45″ longitude 84° 29′ 30″; thence to latitude 36° 05′ 05″ longitude 84° 13′ 30″; thence to latitude 36° 11′ 25″ longitude 84° 07′ 05″, the point of beginning.

▶ **Richland**—Beginning at 46° 33′ 40″ longitude 119° 13′ 00″; thence to latitude 46° 20′ 00″; longitude 119° 13′ 13″; thence to latitude 46° 18′ 06″ longitude 119° 30′ 00″; thence to latitude 46° 26′ 00″ longitude 119° 47′ 25″; thence to latitude 46° 40′ 45″ longitude 110° 47′ 28″; thence to latitude 46° 46′ 50″ longitude 119° 33′ 35″; thence to latitude 46° 46′ 50″ longitude 119° 28′ 16″; thence to latitude 46° 33′ 40″ longitude 119° 13′ 00″, the point of beginning.

▶ **Los Alamos**—Beginning at latitude 36° 00′ 00″ longitude 106° 04′ 00″; thence along the Rio Grande river to latitude 35° 45′ 00″ longitude 106° 15′ 00″; thence to latitude 35° 45′ 00″ longitude 106° 30′ 00″; thence to latitude 36° 00′ 00″ longitude 106° 30′ 00″; thence to latitude 36° 00′ 00″ longitude 106° 04′ 00″, the point of beginning.

CAP Radio Network

California's Civil Air Patrol Wing Week claimed leadership in CAP's national communications network.

Col. Bertrand Rhine, Wing commander, reports that the Wing has in operation 100 radio stations on USAF frequencies, 50 stations on 2374 kc, 50 on vhf frequency, and 22 mobile stations.

BRIEFING FOR DEALERS & DISTRIBUTORS

BARGAIN RIDE—A demonstration ride in a Beech Bonanza four-placer for $1.02, offered by the Rent-A-Plane Co., Spartan hangar No. 3, Tulsa (Okla.) Municipal airport, is the biggest bargain for the flying public which has come to the attention of this column in recent inflationary days. Ralph Smith, manager, reports that more than 1,000 persons have been hopped in the Bonanza. A "checkout" ride is also offered for $8, which gives the passenger the privilege of flying the plane himself from the left side (assuming he has a license.) The company also is renting Bonanzas to competent pilots at the rate of 9 cents a mile plus 40 cents an hour. In the first six months of operation since June it has flown Tulsa business men over 100,000 passenger miles into 26 states.

CESSNA CROSSWIND GEAR—Combination of the Cessna vanadium spring steel landing gear with the Goodyear castering wheel for crosswind landings is now available on two-place Cessna Models 140 and 120. Price is $340 installed at the factory plus trade-in of the regular wheels or a shipout price of $430 which does not include installation. Cessna is testing the gear on its new model 170 four-placer which uses a landing gear interchangeable with that on the two-placers, and presumably should be able to supply the new gear at optional extra cost on the 170 in the near future. When Goodyear makes larger castering wheels, Cessna plans to test them on the four-to-five place models 190 and 195. "The gear may seem expensive, but compared to the price of adding another flight strip on a landing field, it is very cheap," one Cessna official commented. Goodyear officials have been studying the market for the cross-wind wheels very closely. If a sufficient quantity of wheels could be sold to make possible mass production economies a price drop might be in order after initial development costs, in addition to those underwritten by CAA, were paid off.

TOP CESSNA DISTRIBUTORS—Ten sales leaders among Cessna distributors in 1947 rated as follows in order of sales: Pathfinder Flying Service, Stockton, Calif.; Mauk's Airpark, Blackwell, Okla.; Yingling Aircraft, Wichita; Aero Activities, Detroit; Airways, Inc., Des Moines; Mid States Aviation, Sky Harbor, Northport, Ill.; Aero Sales, Omaha; Camfield Aviation, Grand Rapids; Clinton Aviation, Denver and Snohomish (Wash.) Airfield.

STANDARD STINSON EQUIPMENT—Safe Flight Indicator, Dr. Leonard Greene's stall warning indicator, has been adopted as standard equipment on the new 1948 Stinson 165 Voyager. The device, which lights a red light and blows a horn whenever the airplane approaches a stalling condition, regardless of speed or plane's altitude was developed under CAA sponsorship. Stinson owners will benefit from a reduction in insurance premiums, since several insurance underwriters now are giving reduced rates for planes equipped with the indicator. Voyager already was generally regarded as one of the safest planes to fly, due to its virtual inability to spin and its good inherent stability. Inclusion of the stall indicator is regarded as a further step toward making the plane still safer for the business man flyer, who is seen as the principal component of the market for this and other four-place planes. Voyager is second personal plane to make stall indicators standard equipment. Beech Bonanza has a company-built stall indicator of a different type, as standard equipment.

MONOCOUPE INQUIRIES—Since transfer of Monocoupe Airplane and Engine Corp. to Melbourne, Fla., from Orlando, the firm has received inquiries from 12 foreign countries regarding agencies for the aircraft. Frank G. (Jerry) Andrews has recently been appointed sales manager for Monocoupe, by Robert G. Sessler, president. Andrews formerly was with CAA, and more recently with Personal Airplane Sales Corp., and with Aerolog, aviation parts directory. Production of airplanes is scheduled to start in February. An estimated 30 persons were to be employed by Feb. 1. The Melbourne company is a result of the purchase by the Sessler Brothers Airmotive Co., repair base operator at Melbourne, of the equipment and parts and manufacturing rights of the Monocoupe Orlando plant. Plan now is to manufacture two-place 115 hp. Monocoupe, selling for $3,890 flyaway, and a deluxe version with two-position Sensenich propeller and complete instrumentation for $4490 flyaway. Company also projects a two-place 185 hp. clipwing Monocoupe, and a five-place twin engine plane, now in development stage. Monocoupe's old time air show laurels were polished up anew at the recent Miami Air Maneuvers, when Woody Edmondson, Lynchburg, Va., fixed base operator and stunt and racing pilot flew a clipwing Monocoupe to win the international aerobatic championship. —ALEXANDER McSURELY

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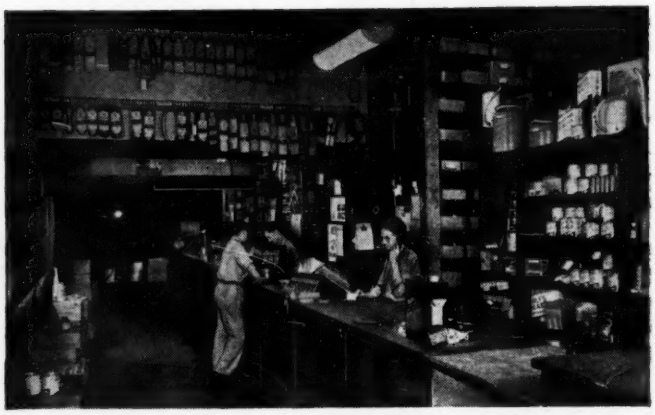

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American and United Declare Dividends on Preferred Stocks

Action seen as boost for airline credit, confidence in future; American maintains continuity of dividends since equity issue in June, 1946.

Airline credit received a much needed lift when American and United Air Lines declared the regular dividends due on their respective preferred stocks.

With mounting deficits and beset with many uncertainties, these two trunk lines by their action, indicated confidence in the future.

The listed market quotations for the preferred stocks of these companies had declined into new low ground recently, casting some doubt as to their reliability as income producers. Current management action may be expected to have some bolstering effect.

▶ **American Maintains Record**—American declared the regular quarterly dividend of $.875 per share payable Mar. 1, 1948, on its $3.50 cumulative convertible preferred stock. This payment will aggregate $350,000 on the 400,000 shares of preferred stock outstanding and maintains the continuity of dividends on this senior equity since its issuance in June, 1946. Despite current deficit operations, this disbursement is a small price to pay for the maintenance of an unbroken dividend record.

After declining to a new low of 50¾, American's preferred recovered to around 56, affording a current yield at the rate of 6.2 percent. This issue was first sold at $102 per share almost two years ago.

Through rigid economies, American has kept operating expenses under control, thus husbanding its cash position. As far as can be determined, the company should be able to meet all of its immediate capital requirements without need of additional financing. It is believed that through a series of circumstances American may not be required to make any large cash expenditures in accepting delivery of the first group, about one-third, of its now reduced order for 75 Convair-Liners.

It is probable that American may establish a line of banking credit on a stand-by basis to handle any unanticipated developments requiring unusual cash disbursements. It is reasonable to assume that should such banking credits be established and drawn upon, dividend payments would be precluded unless earned. However, the company expects to restore rapidly its DC-6s in regular service starting around Mar. 1.

▶ **United Action**—The United dividend action, unlike American's, was in doubt to almost the last moment. The carrier declared the regular quarterly dividend of $1.125 per share on its 4½ percent cumulative preferred stock, also payable Mar. 1. This current payment aggregates about $106,875 on the approximately 95,000 shares outstanding.

The United preferred was issued in January, 1947, at an indicated price of around $105 per share. When its dividend payment began to appear doubtful, the market price broke sharply to a low of 75. The recent recovery brought the market price up to around 82 which indicates a current yield at the annual rate of 5.5 percent.

The current dividend payment on the United preferred is made possible largely by a technical accounting transfer. Late in 1947, the company announced that it was transferring $2,000,000 from its depreciation reserve account to earned surplus (AVIATION WEEK, Dec. 29, 1947). This stratagem has permitted the company to avoid a negative surplus account, albeit by a very slim margin.

While the company may have sufficient latitude to pay dividends on its preferred stock despite the restrictions written in for the protection of the bank loans and debentures during periods of deficit operations, it is questionable whether a management would attempt this action unless an earned surplus account existed.

▶ **DC-6 Boost**—United is also anticipating a restoration of earnings upon the return to service of the DC-6s. This equipment will be particularly profitable on the heavily traveled Hawaiian route operation. The DC-6s also carry a premium fare and are capable of developing a higher rate of earning power than is currently the case with the relatively higher cost DC-4s.

United, however—unlike American—may be faced with a serious financing problem. The former as yet has not selected a replacement for its DC-3 equipment. The company cannot long afford to remain at a competitive disadvantage while American will be flying its pressurized Convair-Liners. Should United embark upon a program of acquiring new Convair-Liners, it will do so at a much higher unit cost than American. Further, United may be forced to raise additional capital funds to finance the acquisition of such new equipment. The status of the capital markets has made it difficult for old-line industrial companies with consistent earnings records to obtain additional funds on favorable terms; an airline without current earnings may find public financing far more difficult if not next to the impossible.

▶ **Northwest Stock Outstanding**—The third airline with a preferred stock currently outstanding is Northwest. This carrier paid the regular quarterly dividend of 28¾ cents per share on its 390,000 shares of 4.6 preference shares. This payment aggregated $112,125 and was made on Feb. 1, 1948. These shares were marketed in April of last year at $25 per share. Currently selling around 22, an annual yield of about 5.2 percent is indicated. This carrier, at last reports, continues to have an $18 million bank credit it has not drawn upon, which presumably will be used to finance Stratocruisers later this year.

All three airline preferreds indicated are convertible into common stock. This provides considerable attraction in times of rising prices with earnings in an uptrend. American's preferred is convertible into common at $21 per share. United's preferred has the option of exchanging four shares of common for each share of preferred. Each share of Northwest preference stock has a call on one and one-half shares of common.

▶ **Atlas Will Underwrite**—Northeast Airlines currently is proposing to issue a convertible preferred stock. However, for all practical purposes this does not represent new financing but for the most part is merely a refunding operation of advances made by the Atlas Corp. The stockholders of Northeast common will have the right to subscribe to a new issue of 83,333 shares of preferred stock. The Atlas Corp., currently holding 100,000 or 20 percent of Northeast's total common stock, has agreed to underwrite all preferred shares not subscribed by the other stockholders. The proceeds received in this manner will be used to retire notes and loans held by the Atlas Corp.

In all cases, basic values for airline equities, both common and preferred, will depend on the earning power the respective companies can develop in the future.

—Selig Altschul

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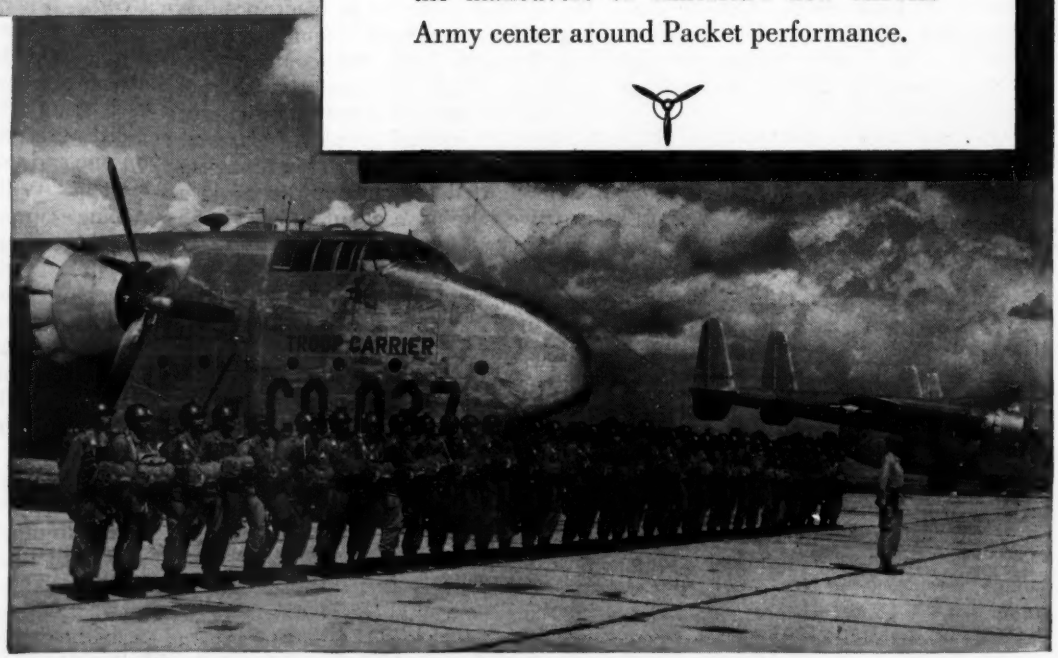


Fairchild Aircraft

Division of Fairchild Engine & Airplane Corporation, Hagerstown, Maryland

House Committee Will Push Bill To Aid Independent Air Freighters

Rees Post Office group seeks air parcel post system on terms favorable to contract carriers; contracts would be awarded, after competitive bidding, to low bidders.

The House Post Office Committee, headed by Kansas' GOP Rep. Ed Rees, is set to push legislation paving the way for independent air freight operators to capture the nation's potentially large air parcel post business, estimated at 144 million packages annually.

The measure, introduced by Rees on behalf of members of the Post Office Committee, would authorize the Department to inaugurate air parcel post service (it is believed the service would attract at least 10 percent of the surface-transported parcel post volume) on the following basis:

• **Contracts for air parcel post** carriage would be awarded by the Department, after competitive bidding, to low bidders. Civil Aeronautics Board would be required to pass on the ability of carriers to perform adequate service.

• **Short-haul service** within the first, second, and third zones would be prohibited. This is based on the committee's conviction that short-haul air service has slight, if any, time-saving value.

• **Rates proposed** in the bill for parcel post shipments, substantially below the rates suggested two years ago by the Post Office Department, would be: fourth zone—20 cents for the first pound, 10.5 cents for the next nine pounds, and 10.25 cents for each additional pound; fifth zone—25 cents for the first pound, 16 cents for the next nine pounds, and 15.5 cents for each additional pound; sixth zone—31 cents for the first pound, 25.5 cents for the next nine pounds, and 22.25 cents for each additional pound; seventh zone—37 cents for the first pound, 29.5 cents for the next nine pounds, and 29.25 cents for each additional pound; eighth zone—43 cents for the first pound, 36.5 cents for the next nine pounds, and 36.25 cents for each additional pound.

• **Reduction of these rates** to encourage increased volume if the Department obtained parcel post contracts at less than a 15 cents per ton-mile rate.

• **Air parcel post service** to the Canal Zone and territories could also be introduced if such service was self-supporting.

The Rees measure is designed to establish a parcel post system of air service between key traffic points, with trans-shipments to minor traffic points left to the less expensive surface transport modes. This is the type system which has been recommended by independent airfreight operators and would dovetail with their major point-to-major point type of operation.

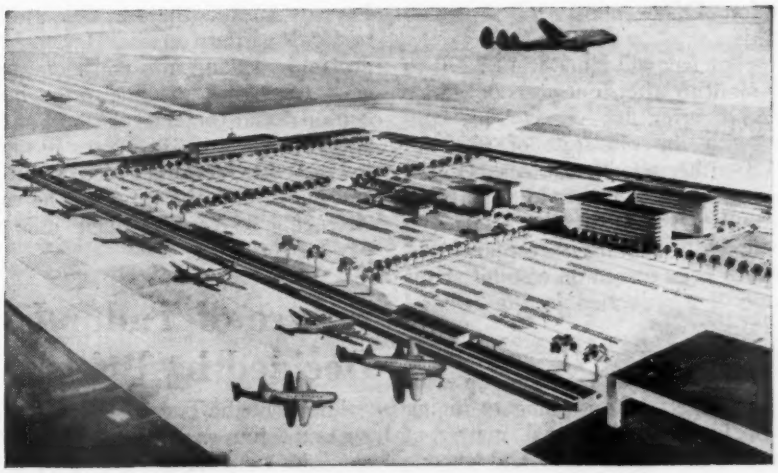
▶ **Describes System**—"It is ridiculous to contemplate an air parcel post system giving all-the-way air service to every town and hamlet in the country," Rees declared. "Such a system would be expensive, would undoubtedly keep the service in the red unless excessively high rates were charged, and would offer little or no time saving."

The Air Transport Association, advocate of the "blanket" type air parcel post system criticized by Rees and airfreight carriers, is vigorously opposed to the Rees legislation. ATA favors making air parcel post service an adjunct to regular air-mail service, now monopolized by the scheduled carriers, with CAB certificates authorizing mail carriage extended to include parcel post. Independent airfreight operators complain that this would bar them from handling government parcel post business, as well as regular mail business.

▶ **P.O. Favors ATA**—Post Office Department leans in favor of ATA's position. Testifying before the House Post Office Committee, Postmaster General Jesse Donaldson pointed out that if parcel post were an adjunct to air-mail service the Department could use excess airline space—now paid for mail transport—for parcel post shipments.

The House Post Office Committee is withholding hearings "for a few weeks" on the Rees measure to permit the Post Office Department to file its recommendations.

Two years ago, the Department drafted legislation embodying its recommendations for an air parcel post system in a bill introduced by Rep. Thomas O'Brien (D., Ill.). It was reintroduced in this Congress by Rep. Harold Hagen (R., Minn.) and is pending before the House Post Office Committee. However, the Department has requested the committee to pigeonhole the measure, since a review indicates that the rates it prescribes would fail to assure a self-supporting service.



PROPOSED TWIN CITIES TERMINAL

Facilities planned for air travelers at the Twin Cities are shown in this artist's conception of a new terminal development at Wold-Chamberlain field. Covering 25 to 30 acres, the proposed terminal is to provide 28 loading positions for feederlines, domestic trunk carriers and international operators. First floor of the administration building (center, foreground) has been designed to handle immigration, customs, agriculture, FBI and health offices. Cost of building facilities for aviation purposes has been set at about $2,000,000. Private capital would finance construction of a hotel (right, center), theater (center) and a shopping area within the unit terminal system. The parking areas are designed to accommodate 5,000 automobiles.

SLICK LANDING BY NORTHWEST

Icing a runway at Wold-Chamberlain field, Minneapolis, and crowding passengers into the rear of the ship to keep the nose high helped in landing this Northwest Airlines DC-4 despite a damaged nosewheel. After taking off with the Chicago-bound DC-4, Capt. Harold Kittleson noticed the plane's nosewheel had not retracted fully into the nose of the ship. He began circling the field while ground crews prepared for the landing. Capt. A. S. Ackerson, a NWA pilot who happened to be in the control tower at the time, suggested icing a runway. Two fire companies pumped water onto the northwest-southeast runway, and in the near-zero temperature the surface soon became slick. The plane was landed without damage.

Pay Increases Provided In UAL-ALPA Contract

United Air Lines and the Air Line Pilots Association late last month signed their new contract embodying substantial pay increases and modified grievance procedure.

Under the revised pay scale, a senior officer flying 80 hours a month (half by day and half by night) will receive from $909.24 for DC-3s to $1,266.68 monthly for DC-6s on the San Francisco-Honolulu run. The new domestic rate for DC-6 pilots is $1,186.68 monthly.

Co-pilot pay will range from $290 to $450 monthly after four years of service and $490 after five years. This contrasts with the old scale of $220 to $380 monthly after four years. United will pay $50 a month additional over the co-pilots' scale to reserve pilots who have flown 300 hours as captains and who have been placed on co-pilot status because of a reduction in the airlines' schedules.

Grievance procedure is modified so that the issues will be taken up with flight managers before going to higher levels. This was the final matter at issue in the negotiations, and at one time provoked a strike threat from the ALPA.

NAL Cites Problems On Havana Operation

Heavy competition both from foreign carriers and from Pan American Airways has brought about substantial losses on National Airlines' routes to Havana, Cuba.

NAL told the Civil Aeronautics Board it sustained a net operating loss of $64,002 on its Tampa/Miami to Havana link between Dec. 15, 1946, when service was inaugurated, and Nov. 30, 1947. The carrier said it lost a large amount of traffic to Linea Aeropostal Venezolana and Peruvian International Airways "which are authorized to fly nonstop from Havana to New York and Washington, while National is required to stop all flights at Tampa."

Services into Cuba are extraordinarily expensive because of the very high landing and aircraft handling fees at Rancho Boyeros Airport—the only field available to U. S. carriers serving Havana, NAL declared. Taking into consideration recent wage and gasoline price boosts, National said the current trend of operating revenues and expenses is such as to indicate continued losses on the Havana link in the future. The carrier is seeking 95 cents a plane mile mail pay for the route.

Future of Tudor I Decided by British

Future of the Tudor I—Great Britain's postwar, four-engine transport which allegedly was cold-shouldered by British Overseas Airways Corp.—has been decided by a government committee of inquiry.

Blaming both A. V. Roe (manufacturer of the Tudor I) and BOAC for failure to cooperate more closely in bringing the 24-passenger craft into operational use, the government report said the ship should go into overseas service if final tests are successful. A. V. Roe had charged that BOAC insisted on numerous alterations to delay production to the Tudor I and then bought U. S. planes.

►**BOAC Justified**—The committee declared BOAC was justified in buying Constellations for its north-Atlantic service in 1945, "when it was plain the Tudor was late and it was impossible to estimate with any accuracy when it might be available."

When ready, the Tudor I, with necessary modifications, should be operated in a manner best suited for development of BOAC's services, the report said. It is expected that the new plane will be used for service to the Middle East, India and possibly to Australia, but (in accordance with BOAC's wishes) probably not on the highly-competitive north-Atlantic run.

BOAC is now operating its London-New York route with Constellations. It expects to add six Boeing Stratocruisers to its north-Atlantic fleet late this year.

BSAA in Black

British South American Airways Corp., smallest of Great Britain's three state-owned carriers, has reported a profit of about $82,000 during its first eight months of operation to Mar. 31, 1947. Previously, British Overseas Airways Corp. and British European Airways had shown deficits aggregating more than $40,000,000 for their first operating years (AVIATION WEEK, Jan. 5 and Jan. 12).

Cargo Rate Ruling

Taking action to maintain the status quo pending outcome of its broad investigation of airfreight rates, the Civil Aeronautics Board has extended for 90 days the suspension period of reduced cargo tariffs filed last fall by seven certificated airlines (AVIATION WEEK, Nov. 3).

The original 90-day suspension, involving tariffs filed by American Airlines, Inland, Western, PCA, United, Southwest and TWA, expired Jan. 22. A public hearing on CAB's freight rate investigation is scheduled this week.

Meanwhile, both certificated and uncertificated carriers report that the normal seasonal decline in cargo has been less than usual during January. A third increase in Railway Express Agency's first-class surface rates in little over a year has given air cargo officials further cause for optimism. The new 10 percent hike went into effect Jan. 22, and is expected to shift considerable traffic from surface to air.

SHORTLINES

▶ **Bruning Aviation**—CAB has denied the Springfield, Mass., carrier a special exemption which would have permitted the company to qualify as an uncertificated cargo line under section 292.5 of the Board's Economic Regulations.

▶ **Florida Airways**—Company's AM 75 feeder certificate has been amended by CAB to include Perry and Leesburg, Fla., as intermediate points.

▶ **Linea Aeropostal Venezolana**—CAB has extended the company's foreign air carrier permit for three months.

▶ **Mid-Continent**—Workers who are members of the Brotherhood of Railway and Steamship Clerks, Freight Handlers and Station Employes have been awarded wage increases of 17 cents an hour (for those paid by the hour) and $29.47 (for those paid monthly). Findings were made by a National Mediation Board panel of arbitrators. The union has sought an hourly increase of 50 cents and a monthly hike of $86.67. ...Company has bought three additional DC-3s to handle traffic over its new Kansas City-St. Louis route.

▶ **Monarch**—During its first year of operation ended Nov. 27 flew 3,552,684 passenger miles and 69,361,730 pound miles of freight.

▶ **Pioneer**—Carried 62,698 passengers in 1947 against 20,687 in 1946; mail ton miles increased from 19,449 to 37,147; and express ton miles from 6,539 to 17,842. Passenger traffic per plane mile gained more than 27 percent over 1946. ...PAL, in cooperation with the University of Texas, expects to inaugurate a program of practical training for air transportation students this month.

▶ **Skytrain Airways**—CAB has denied the New Orleans operator a temporary exemption to carry passengers on an irregular basis between New Orleans and Belize, British Honduras, pending disposition of the company's application for a certificate.

▶ **Trans-Canada**—Has established a New York district cargo sales office.

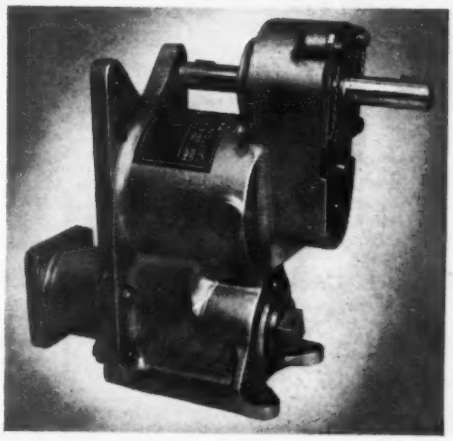
▶ **TWA**—Carried 66,384 international passengers in 1947, a gain of 103 percent over 1946. Express and freight increased 220 percent to 3,016,245 ton miles, and mail was up 75 percent to 3,273,501 ton miles.

▶ **United**—Between May 1, 1947, when service started, and Dec. 31 flew 16,145 persons between San Francisco and Honolulu. Air mail totaled 196,000 ton miles and freight 77,000 ton miles.... UAL expects to have vacancies for 400 stewardesses this year and will re-open its training school at Cheyenne, Wyo., on Feb. 4.

"PACIFIC-WESTERN"

Assists in Aviation Progress

Both the jet and propeller driven versions of the Flying Wing utilize Western Gear Works built actuator units to provide important mechanical controls.



Photograph shows Western Gear Works built actuator model 530090 used for bomb bay door operation.

The world has seen aviation history made as the Northrop Flying Wings take to the sky. Once again Western Gear Works has participated in important aviation progress. For example, 13 Western Gear Works' actuators are used on the propeller-driven Wing ranging from jack screw to rotary types and performing such functions as bomb door, camera door and trim flap operation. Additional Pacific-Western actuators are used on the jet powered Wing.

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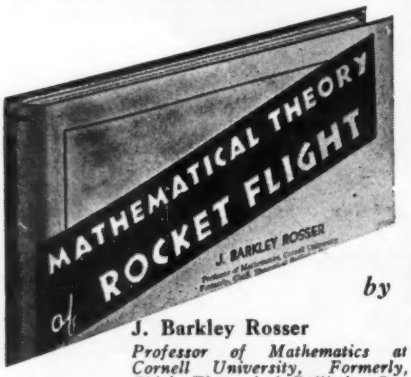

by

J. Barkley Rosser
Professor of Mathematics at Cornell University, Formerly, Chief, Theoretical Ballistics Section, Allegany Ballistics Laboratory

Robert R. Newton
Member of Technical Staff, Bell Telephone Laboratories, Inc., Murray Hill, N. J. Formerly Research Associate, Allegany Ballistics Laboratory

George L. Gross
Research Engineer in Applied Mathematics. Grumman Aircraft Engineering Corporation, Bethpage, N. Y. Formerly Research Associate, Allegany Ballistics Laboratory

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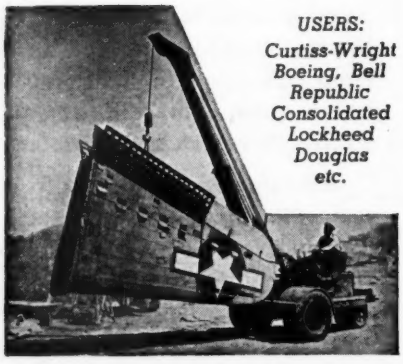

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American Names Miller To Board of Directors

Robert W. Miller, president of the Pacific Lighting Corp., has been elected to American Airlines' board of directors. He will replace James Bruce, who resigned from the board last September after being named Ambassador to Argentina.

At the same time AA announced the appointment of William H. Hipple as southern regional director of public relations with headquarters at Dallas. Hipple recently returned from Europe, where he was a public relations executive for American Overseas Airlines.

Other personnel developments:

- **Irish Air Lines**—Has named John M. Cody as advertising and public relations officer in the U. S. with headquarters in New York. He was formerly eastern advertising manager for Lockheed Aircraft Corp.
- **National**—Gilbert G. Budwig has been appointed to the newly-created post of director of planning; and Adolph C. Liska has become director of maintenance.
- **Northeast**—Robert H. Herrnstein has been elected assistant treasurer.
- **Northwest**—Has appointed C. E. Swanson to head the NWA staff at Boeing's Seattle plant. He succeeds E. B. Curry, who recently was named general superintendent of aircraft maintenance for Northwest.
- **Slick**—W. F. Rogers, vice president in charge of sales and traffic, has been appointed to the new post of vice president and assistant to the president.
- **United**—J. W. Eberly has become assistant vice president-personnel. Homer J. Merchant has been named assistant general manager of ground services.
- **Western**—M. E. Sullivan has been appointed assistant general traffic manager.

Irish Get Permit

Aer Linte Eireann Teoranta (Irish Air Lines) has received a foreign air carrier permit from CAB and will become the ninth scheduled operator on the Europe-U. S. run when service is inaugurated Mar. 17. The permit authorizes flights between Ireland and New York via Newfoundland and Boston; and between Ireland and Chicago via Newfoundland and Montreal, Canada. Model 749 Constellations—of which AET owns five—will make three round-trips weekly on the Ireland-New York route at the outset (AVIATION WEEK, Jan. 12).

CAB SCHEDULE

Feb. 2. Hearing on Board's investigation of airfreight rates. (Docket 1705 et al.)

Feb. 4. Hearing on Contintental Air Lines' route consolidation case. (Docket 576 et al.)

Feb. 9. Hearing on Mid-Continent's application for alternate Kansas City-New Orleans route. (Docket 1956.)

Feb. 21. Hearing on Mid-Continent's Minot, N. D.-Regina, Saskatchewan, route case. (Docket 628.)

Mar. 15. Hearing on additional service in Hawaiian Islands. (Docket 2390 et al.)

May 15. Hearing on Capital Airlines (PCA) mail rate case. (Docket 484.)

Canadian Embargo Hurting Colonial

Canada's dollar shortage is having an adverse effect on air travel between the U. S. and the Dominion, according to a recent Colonial Airlines report to the Civil Aeronautics Board.

Last November, Colonial pointed out, Canada passed a law which limited Canadian citizens to expenditures aggregating about $150 yearly anywhere except in sterling exchange areas. In addition, the embargo prevents importation into Canada of a great number of articles and commodities produced in the U. S., the report said.

▶ **Traffic Hit**—"Effect of this embargo is to reduce sharply the traffic available in Canada as well as commercial traffic generated in the U. S. Canadians who in the past frequently used Colonial's service from Ottawa and Montreal to New York and Washington for business, personal or vacation purposes, can no longer make more than one or two trips per year and may, for patriotic reasons, refrain from making any trip to the U. S."

Colonial said American businessmen who traveled to Canada over Colonial's routes will not be able to make sales in the Dominion while the embargo lasts. The carrier added that in all probability the embargo will continue for the duration of the dollar shortage.

The carrier indicated that the embargo makes higher mail pay even more urgent. Colonial said it had an operating loss of $818,789 (at its present 20 cents a plane mile mail rate) on its U. S. and Canadian links during the first 11 months of 1947. A mail rate increase to 50 cents a plane mile was requested.

United Opposes Parks On Certificate Request

Parks Air Transport's request that CAB issue the certificate covering routes designated for PAT in the Board's Great Lakes and North Central Area decisions has run into strong opposition from United Air Lines.

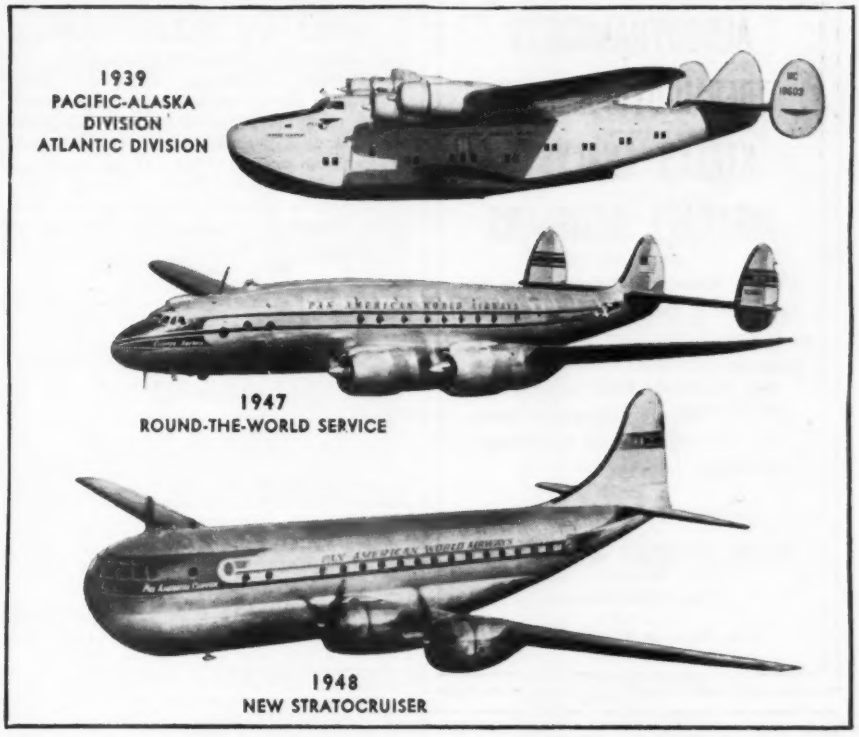
United told CAB that Parks is seeking to "remake" the routes awarded to it by the process of exemptions, substitutions and suspension of service. CAB, in designating Parks for the routes, said it would issue a certificate when the feeder showed that sufficient airports are available to permit operations in accordance with the Board's intentions. UAL states that Parks can not serve the "reasonable number of points" specified by CAB.

United said that of the 41 points awarded Parks in the North Central and Great Lakes cases, 23 points are not certificated on trunkline systems. "At 18 of these 23 new cities, airport facilities are inadequate, and at one additional point they are questionable. If given a certificate, Parks would promptly request authority to suspend service at those 18 or 19 cities. Thus, notwithstanding the award to it of 2,250 miles of routes in six states, Parks would provide service to a total of only four or five new cities."

Meanwhile, Ozark Air Lines, unsuccessful applicant in the Mississippi Valley Area case, asked a rehearing and reconsideration of that proceeding, contending that CAB had erroneously given Parks routes which can best be served by Ozark. Ozark said that "because of severe financial losses suffered by Parks and its affiliated companies during the past two years, it is not fit, willing and able to perform the services found to be required."

Certificate Transferred

CAB has approved the transfer of Peterburg Air Service's certificate of public convenience and necessity to Alaska Island Airlines, Ketchikan.



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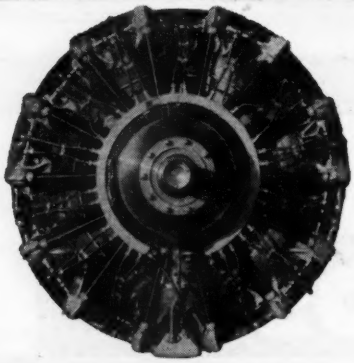

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EDITORIAL

Lightplanes Looking Up

Lightplane makers have been subjected to a barrage of criticism since war's end for lacking vision and enterprise. But the paralysis of prewar designs is being shaken off. There are heartening signs of progress, especially in the competitive four-place market described by Alexander McSurely in this magazine Dec. 15. It is seldom that publicity has failed to keep up with technical advancements in aviation, but this is an example.

Broadly, these trends are apparent:

With few exceptions designs are toward non-spin or spin-resistant characteristics.

Efforts toward reduction of noise—both outside and for the occupant—are barely started, and are far from satisfactory. But industry attitude toward noise is in sharp contrast to the lethargy of a year ago. The Beech Bonanza and Stinson probably lead in efforts to date. Important experiments such as those at Boston are underway.

Four-placers are showing unprecedented roominess and ease of entry.

Controllable and two-position propellers for lightplanes are gaining recognition from airframe manufacturers.

More power is available, partly through larger engines, partly by increasing output of established engines.

Development of improved landing gears, both fixed and retractable, moves ahead, with castering gears and wheels for cross-wind landing.

Use of flaps and slots is increasing.

Manufacturers are deeply interested in stall warning indicators, and announcements are expected from more firms who will offer these devices as optional or standard equipment.

Although there is no favoritism intended here, it appears from this vantage point that Beech, Stinson, Cessna and Luscombe have built more postwar engineering improvements into their products than any others now on the market. Navion, Swift and Ercoupe all represented advanced designs when they appeared but modifications have been minor.

The Bonanza boasts an efficient flap, butterfly tail, flush riveting on its exterior surfaces, and utilizes more magnesium than most other light craft. It has complete instrumentation and two-way radio. A stall warning indicator is standard equipment. It is probably the fastest ship in the four-place class. Although virtually a two-control plane in the air, its rudder pedals are available for cross wind landings.

Stinson's popular Voyager developed from the prewar Model 105, which had slots and flaps, an advanced design for its day. Stinson management has registered keen interest in virtually every postwar engineering improvement. It was the first to conduct its own experiments with cross-wind Goodyear wheels on its production model. It was a pioneer in postwar cabin soundproofing and engine muffling, and is carrying this work forward in cooperation with the aeronautical research experiments at Harvard-MIT, whom it lent a Voyager for tests with various multi-bladed Sensenich propellers turned at low speeds by a geared Franklin. Standard two-way radio and a choice of several panels are offered. Stinson has just announced standard installations of the safe flight stall warning indicator on all Voyagers. The plane is spin resistant.

Cessna's vanadium steel landing gear is probably the best known postwar development of any airframe maker, and it has worked out well in improved performance and safety. Now, Cessna is combining the Goodyear wheel with this gear as an optional extra which is the first time this crosswind wheel has been made a CAA-approved factory installation.

Luscombe's new Silflex landing gear appears to be equally as good as the Cessna installation, except for possibly some more drag. Luscombe was the first to put an all-metal two-placer in production. Most other production models still have fabric-covered wings. Luscombe has sought always to direct its engineering toward economy in production, with the result that its price has been held down. The new Luscombe four-placer is reported to have excellent visibility and roominess, good performance, and fixed gearplane.

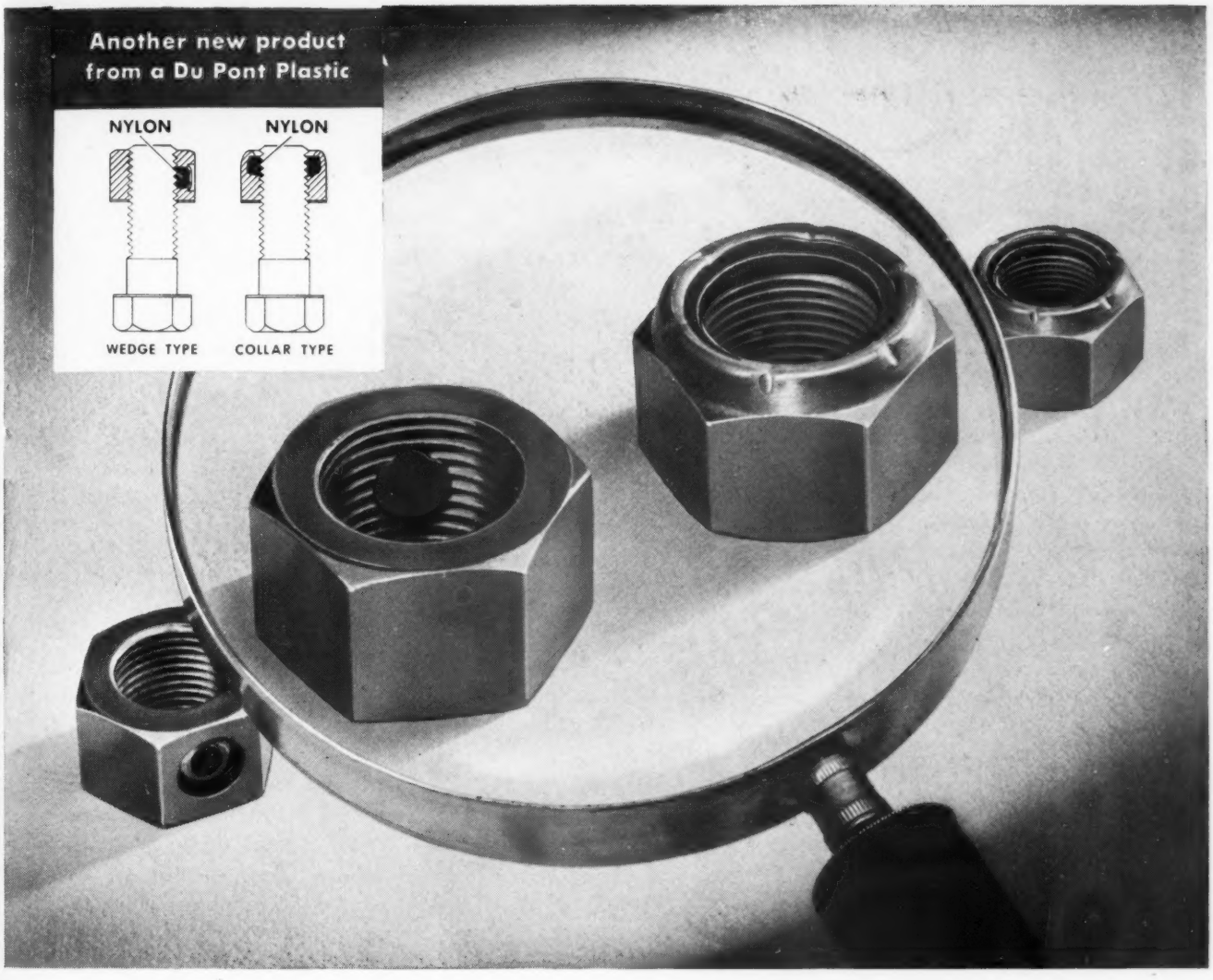
The Ryan Navion is little changed except for improved appearance and interior fittings, but the company is understood to have plans for new features. It is spin-resistant.

Aeronca and Piper are mainly concerned with basic designs of prewar history.

The Temco Swift 125 is slightly improved over the original Globe 125, but it has the reputation of a high-performance two-placer.

Other manufacturers may feel that this is an incomplete outline of major advancements in the postwar lightplane. If they do, let them write to report their improvement plans, present or future. No company striving to improve its product should hide its light under the proverbial bushel, although for too long there have been over optimistic claims in advertising and publicity handouts. The widest publicity given all lightplane improvements, however, can only promote the industry. Lightplane manufacturers are stirring, although there is a long, hard road ahead. More power to them all.

ROBERT H. WOOD



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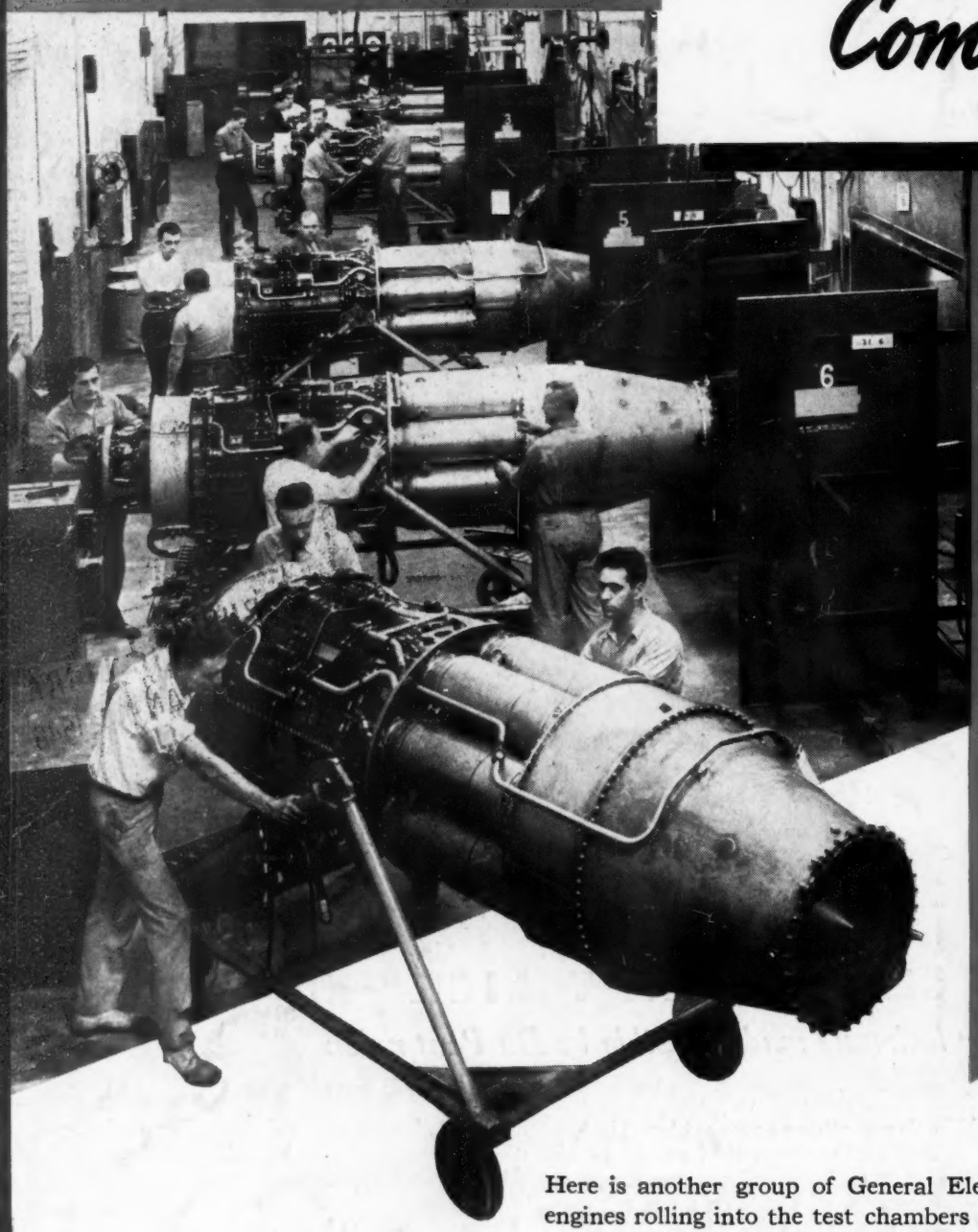

Here is another group of General Electric's torpedo-shaped TG-180 jet engines rolling into the test chambers at our aircraft gas turbine factory in Lynn, Mass. In its test chamber, every jet engine gets a full-power "shake-down" run. Then, like any aircraft engine, it is dismantled, inspected, reassembled, and given a final test before shipment.

All types of electric aircraft equipment, in addition to jet engines, are built by General Electric. Part of G.E.'s line of electric aircraft equipment includes: generators—complete power systems, turbosuperchargers, explosion-proof motors and control, gas turbines, flight recorders, instruments, ignition systems, specialized electrical equipment. When you need a complete power or ignition system, or a single instrument, or when a specialized application requires individual attention, we'll be glad to arrange to supply it for you. *Apparatus Department, General Electric Company, Schenectady, New York.*

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